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DISEASES
OF
INFANTS AND CHILDREN

BY

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TO
THE STUDENTS
BOTH GRADUATE AND UNDERGRADUATE
IN THE
UNITED STATES AND CANADA
WHOM IT HAS BEEN OUR PLEASURE TO TEACH
THIS
BOOK IS DEDICATED.

41095

PREFACE TO THE THIRD EDITION.

The repeated printings of this book have necessitated the making of new plates. This has given us an opportunity to thoroughly revise the text, bringing each section into accord with the advances which are constantly being made in this specialty.

The section on Infant Feeding has been recast and new topics added, such as albumen-milk feeding; special diet lists for older children; and the action of catalyzers.

In the Infectious Diseases the Schick and the luetin tests have been described. Mental tests especially adapted for the early months of life have been included, owing to the widespread interest in prophylactic pediatrics.

Many of the photographs have been replaced with new ones when it was thought that such a change would further add to the value of the descriptive matter.

By a change of type the rarer and the less important diseases have been differentiated, and the book thus made more practical for teaching purposes.

It is hoped that the need for a work as compact as is consistent with thoroughness and completeness will insure the same kind reception which has thus far been accorded it by the profession.

The unfailing courtesy and helpful suggestions of the publishers are hereby acknowledged with thanks.

H. D. C.— G. R. P.

July 1st, 1915.

PREFACE TO THE FIRST EDITION.

THIS volume has been written by teachers who feel that a large contact with students has made them fairly familiar with their needs. Probably the first requirement at present is to bring each branch of medicine into as compact a form as is consistent with a thorough presentation of the subject. Our aim has been to accomplish this with pediatrics. To many, the diagnosis and treatment of diseases of infants and children are most perplexing. These difficulties can only be overcome by first sharply differentiating the anatomical and physiological peculiarities of the infant and child, and then considering their practical bearings.

The student must be familiarized with all the more recent tests, as well as the older practical bedside experience, in the study of disease. He will then, by a systematic examination of the patient, be able to make a scientific diagnosis. He must also be taught to treat rationally and with a distinct purpose in mind. We have aimed to present the subject in this way, and thus to make the work as practical as possible. The physician needs such a description of disease as he will actually encounter at the bedside. Where pictures can serve as a type, we have used illustrations, most of which are original. Theory and pathology have only been considered in so far as may be necessary to an understanding of the diagnosis, course and treatment of disease. We have tried to take a middle course between the compendium, which is usually unsatisfactory, and a too exhaustive work, which, by dwelling over much on theory and exceptions, tends to confuse the reader.

Our thanks are due to our hospital assistants, Drs. Dennett and Albee, for their help during the progress of the work. While a book of this sort must be indebted to all the workers in pediatrics, whom we have freely consulted, our personal experience at the Infants' and Children's Wards of the New York Post-Graduate Hospital, and in private practice, has formed the essential basis of our description of the diseases and their treatment.

Our thanks are due to the publishers for their care and courtesy in the preparation of the book.

THE AUTHORS.

New York, September, 1909.

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THE NEWLY-BORN.

CHAPTER I.

THE MANAGEMENT AND CARE OF PREMATURE INFANTS.

When a premature infant is born it is suddenly deprived of a very important organ, namely, the placenta, which has a selective action for the developing fetus. Three and sometimes four factors mitigate strongly against its extrauterine existence. These factors are in the order of their importance: (1) Undeveloped heat and respiratory centers; (2) increased susceptibility to infection; (3) patent umbilical vessels with a tendency to putrefaction; and (4) sometimes possible congenital disease from its progenitors.

The temperature of a premature babe at the time of birth varies from 98.6° to 100° F. It is often suddenly introduced into, and examined in a room temperature of 74° F.; that is, with a variation of 24° or 26° F. A subnormal temperature undoubtedly often results, from which the child's undeveloped heat centers fail to assist it. A lowered temperature, then, is the first evil to combat.

More than one-half of all deaths under four weeks are attributable to prematurity. We believe that many premature infants that help to swell the mortality statistics may be saved by timely and appropriate directions from their medical attendants. More viable under-term children are born now than formerly, owing to better methods at the time of birth and to such surgical measures as Cesarean section. The records of those born and reared in a maternity hospital show a high percentage saved; but these cases had never been exposed to chilling and transportation and had the advantage of woman's milk as a pabulum. Our maternity hospitals have no facilities for caring for outside cases, and these are finally sent after a variable time to an institution which has an incubator. The natural solution would seem to be incubator life, and this apparatus will maintain the body heat, if properly managed, at 90° F., but it will also necessitate that the babe respire this superheated air, often vitiated and liable to germ contamination. Constant and eternal vigilance is required to keep the apparatus — even the best obtainable — in proper working order. If the temperature rises suddenly, a heat stroke results, and if the gas pressure falls or the wind changes, a subnormal temperature may follow. The premature infant delivered at home should therefore be placed in a padded basket or crib (see Fig. 1) and surrounded with hot-water bottles, or kept warm with an electric heater. The room must be quiet and a sunny one; it should be kept at 78° to 80° F., preferably heated and ventilated by an open fireplace. The supply of fresh air should be constant. If unavoidably the infant's temperature has fallen to subnormal, a warm bath and gentle friction are indicated before supplying the swaddling blankets made of cotton which are to serve as clothes. The importance of conserving this body heat may be emphasized by the statistics of Budin in France. Ninety per cent. of the premature infants died who had a temperature between 90° and 92° F.

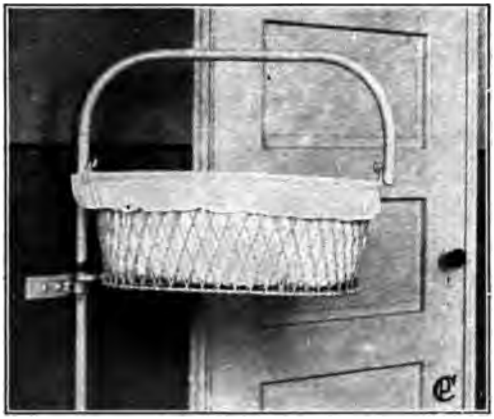


FIG. 1.—Padded basket-crib suitable for premature infants replacing an incubator.

It is a significant fact that the great majority of cases brought to us for incubator life at the hospital have a subnormal temperature.

The weight and length must next be considered in its relation to viability and to feeding. If the weight is below 2⅕ pounds, the premature are rarely saved, while those with birth weights between 2⅕ and 5 pounds are to be regarded as congenitally feeble. The length of time in utero is, however, of greater importance than the birth weight in establishing the ognosis. Moore saved a premature infant born at the sixth month of on which was nine inches long and weighed one and one-half pounds (this babe weighed 19 pounds at the end of fifteen months). Therefore, if the child is born alive, it should be given every chance to live. The obstetrician should immediately place the babe in a warmed blanket or in warm cotton wool and have hot bottles close to its body and beneath it. Swaddling clothes are later used.

The next problem will be that of nutrition. An undeveloped digestive tract with a minimum amount of secretions and an over-active liver will demand careful consideration. The breast milk of a woman whose child is about ten days old is the ideal food. This should be diluted with water three times in the beginning, and later twice, and finally undiluted breast milk is allowed, especially if the infant is strong enough to suck. The quantity given should approximate one-fifth of the baby's weight, if it is above four and a half pounds; but very small amounts, one dram every hour, should be ordered for the first few days, and very gradually increased.

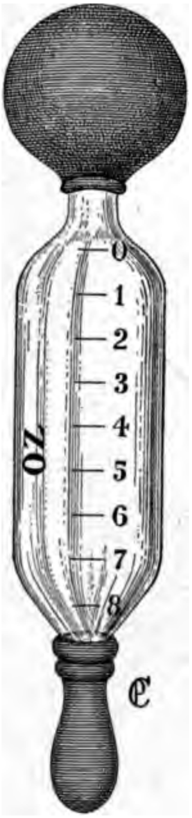


FIG. 2.—Breck feeder for premature infants.

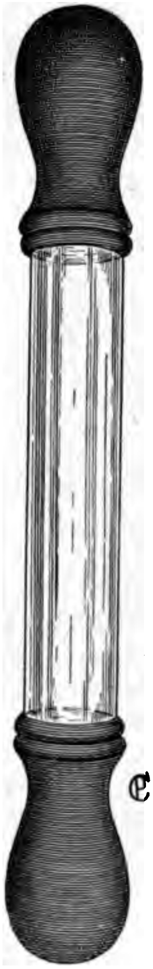


FIG. 3.—Home-made feeder.

The mother's own milk should be pumped, massaged, or nursed out by another stronger child, but should not be used for a week or ten days, as the colostrum at this period of gestation, as shown by Adriance, is too rich in proteins. A wet nurse for a short period or a small amount of breast milk (often one ounce will be helpful for twenty-four hours) should be otherwise obtained. If this is impossible, a 4 per cent. dextri-maltose solution is fed for a few days. Plain whey made as directed on page 141 may be now fed in 1 to 2 dram doses every hour, depending upon the weight of the child. This is gradually increased to 1 oz. every 1½ to 2 hours. If the premature infant is one born nearly at term, with its powers of suckling w developed, ½ per cent. fat is added to the whey. Attention must be called to the great value of even a small quantity of breast milk, to assist in the digestion of the artificial feeding. Later, as the weight increases, skimmed milk mixtures made from the mixed remaining milk, after removing top 4 oz., and diluted 5 times with cold boiled water, to which 4 per cent. of sugar has been added, will usually be found to agree.

Peptonization is indicated if the stools show feeble digestion. The weaker infants are fed with a dropper, while those capable of making sucking efforts are fed with a modified Breck feeder. This can be made from a piece of glass tubing with dropper nipples applied, the one being perforated by three small holes (see Figs. 2 and 3). Gavage is dangerous, for we have found milk in the trachea and bronchi of premature infants at autopsy which reached there *via* the tube. The medical attendant must not be discouraged to note a falling off in weight for some time. It is sometimes three to four weeks before the birth weight is regained. The nurse must be ever watchful for attacks of cyanosis, which must be combated with two- to five-drop doses of diluted brandy, or camphor, gr. ¼, in sterile olive oil hypodermically. The icterus, which is not uncommon and which is usually associated with constipation, often produces fatal results. It is best treated with one- to two-twentieths of calomel.

Daily inunctions of liquid petrolatum (albolin) are given in lieu of baths for cleanliness after the usual diapering. After the first year these premature infants are not necessarily weak and puny, but on the contrary are often indistinguishable from the full-term infant. The prognosis, however, should always be considered as unfavorable, as the undeveloped digestive tract, the possibility of sepsis, and the defects in the heart all mitigate against its existence. The importance, however, of obtaining breast milk cannot be overestimated, for it is almost impossible to raise them without its help. Our experience, which includes over one hundred premature cases, leads us to advocate the open method of treating premature infants to the use of the incubator, and we have tried all kinds. If an incubator is used, only the type having connection with the outside air should be employed, as these infants are exceedingly susceptible to a lack of fresh air.

CHAPTER II.

INJURIES DURING BIRTH.

Deformity of Head.

A certain pointing toward the occiput and elongation of the head are noted in most labors. This may be extreme in cases where a long or difficult labor has resulted in excessive moulding of the presenting part. Fortunately, little damage is done by this distortion and the head usually takes on its natural shape in a few days.

Caput Succedaneum.

The swelling on the presenting part of the head resulting from pressure is known as caput succedaneum. It consists of transuded serum and extravasated blood located between the scalp and pericranium in the loose connective tissue of this part. It has a soft, boggy feeling. Prolonged or difficult labors produce this effusion from pressure on the portion of the head that presents. No special treatment is required, as the absorbents of the connective tissue will cause its disappearance within a day or so.

Cephalhematoma.

CEPHALHEMATOMA is an effusion of blood between the bone and the periosteum covering it. It usually appears within one to three days after birth. Its seat may be any portion of the cranial vault. Most commonly it occurs in the parietal region, sometimes over the temporal or occipital bones. The overlying integument presents no discoloration. A bony ring is soon developed around the base from the secretion of the periosteum. The effusion is, in most cases, limited by a suture. The effused blood, as a rule, undergoes absorption within the first three months of life. In rare cases suppuration ensues, and even caries of the subjacent bone may occur. The fact that the tumor does not communicate with the brain cavity, which fact can usually be readily made out by palpation, serves to distinguish this affection from encephalocele. To differentiate caput succedaneum and cephalhematoma it may be borne in mind that while the former is nonfluctuating and disappears in a few days, the latter is soft and fluctuating, presenting a marginal ridge, in the center of which the skull is felt, and disappears in a few months.

Treatment.— In most cases no treatment is called for. Should the tumor grow it may be strapped with adhesive plaster, the head first being shaved. Incision, while generally condemned, has been practised with success. It offers the advantage of immediate relief and leaves no permanent deformity. The effused blood can usually be removed through a small opening. A firm compress is worn for several days to prevent refilling. It is needless to say that the strictest asepsis must be observed. If suppuration occurs the usual surgical treatment of abscess must be carried out.

Injuries to Bone and Muscle.

(*a*) BONE.—The soft and partially developed condition of infantile bone renders it liable to injury if subjected to much mechanical violence during delivery. The cranial bones are especially liable to indentation and fracture when the forceps is employed, yet such accidents may occur in spontaneous labor. Fracture of the cranial bones is most frequent in the parietals. When the brain is not injured the fracture is not apt to result seriously. Rupture of intracranial blood-vessels may lead to fatal hemorrhage. Simple indentations apparently cause little if any damage to the brain structures. Gentle efforts at reduction may be attempted, and thus the normal shape be restored. Fracture of the inferior maxillary bone may result from traction with the fingers in unskillful delivery of the after-coming head in breech presentations. Injuries may be inflicted upon the vertebræ or the spinal cord, with resulting paraplegia, and they are almost invariably fatal. Fracture of the humerus not uncommonly occurs in forcible delivery of the arm in breech births, or separation of the epiphysis from the shaft of the bone may take place. Fracture of the clavicle usually results from violent use of the fingers in extracting the after-coming head. The femur may be fractured from misdirected traction with fingers or fillet in breech delivery.

(*b*) MUSCLE.—Hematoma of the sternocleidomastoid muscle may result from artificial interference in breech extractions. A hard tumor about the size of a pigeon's egg may be seen developing in this muscle, usually on its anterior border. It is noticed between the ages of one and six weeks, and usually disappears by absorption in a month or so. The muscle fibers are sometimes torn. Hematoma of the sternocleidomastoid may lead to contracture of the injured muscle and torticollis. As a rule, the blood is spontaneously absorbed in a few weeks.

Birth Palsies.

Injuries to the nerves during birth may be central or peripheral. The latter are fortunately the most common, and the usual types are facial and upper-arm paralysis.

(*a*) FACIAL PARALYSIS.— Pressure upon the seventh or facial nerve at the stylomastoid foramen by the blades of the forceps is usually responsible for facial paralysis. The affection is, in most cases, unilateral, and will not be noticed when the infant is at rest. When nursing or crying, the palsy of the affected side is apparent. Recovery usually takes place spontaneously in a few weeks. If the paralysis does not disappear promptly, faradism may be employed. In rare cases the palsy is permanent.

(*b*) UPPER-ARM PARALYSIS (ERB'S OR DUCHENNE'S PARALYSIS).— The next most frequent peripheral palsy is seen in the arm. Various conditions during birth may produce compression and injury of the nerves about the shoulder, such as severe pressure of the obstetrician's finger or the blunt hook in the axilla, hematoma of the sternocleidomastoid, or fracture of the humerus with displacement of the fragments. The greatest number of upper-arm paralyses, generally known as Erb's or Duchenne's paralysis, occur after breech deliveries. The injury usually results from traction made upon the shoulder in the delivery of the head, or in bringing down the arm when it is found above the head or upon the head in vertex deliveries, and is due, as a rule, to stretching of the fifth, sixth, and seventh cervical nerves. Dragging the head or the trunk strongly to one side is usually responsible for the excessive traction upon the nerve trunks of the injured side. The deltoid, biceps, brachialis anticus, and supinator longus are the muscles oftenest affected. In mild cases the paralysis may not be noticed for some weeks, while in severe ones it will usually be apparent at once.

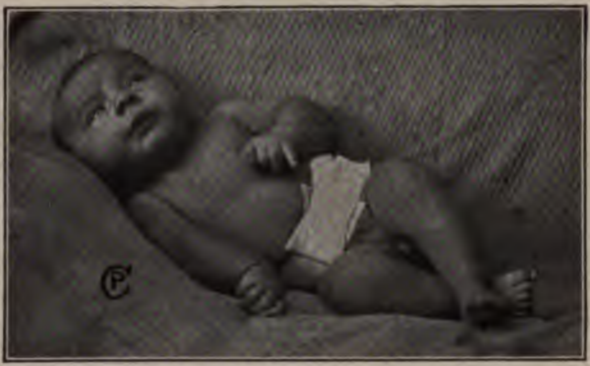


FIG. 4.—Erb's paralysis—right arm affected.

Diagnosis.— The position of the arm is characteristic. It hangs helpless at the side and is rotated inward. As the triceps is not affected, the child can extend the forearm, but cannot flex it. After a few weeks the affected muscles show more or less atrophy, but the child will generally begin to use the forearm. The diagnosis of Erb's paralysis is not, as a rule, difficult when seen during the first year. The peculiar position of the arm and the group of muscles involved are rarely met with in any other affection at this early age.

Prognosis.— The prognosis will depend upon the severity of the symptoms and the time when the treatment is begun. Spontaneous recovery takes place in some cases within two or three months. If there is but little improvement after this length of time, spontaneous recovery is not to be expected, and the case demands active treatment. In some cases partial paralysis may remain for several years or be permanent.

Treatment should be begun early, and should consist in massage, passive motions of the joint and the persistent use of electricity. If the muscles react to the faradic current, it may be used; but if not, the galvanic current must be employed. The treatment must be continued for several months, or until recovery is nearly complete. The foregoing treatment applies also in facial paralysis.

CENTRAL PARALYSIS.— Meningeal apoplexy, followed by various paralyses, is one of the untoward results of prolonged and difficult labor. This is more apt to occur with the first-born child owing to the unyielding character of the maternal parts. While hemiplegia is the rule, from the distribution of the hemorrhage over the surface of one side of the brain, there may be less diffused local hemorrhages resulting in paralysis of the face or of one arm or leg. In eleven autopsies following this injury, as reported by Dr. McNutt, the hemorrhage was principally at the base of the brain in the vertex presentation, whereas it was largely on the convexity in the breech presentations. It has been supposed that the use of forceps is largely responsible for this accident, and the rough and careless use of instruments is doubtless a competent cause. The writer believes, however, that too long delay in the application of the forceps when the head is being subjected to prolonged pressure is oftener responsible for this unfortunate accident. The careless use of drugs before delivery, by inducing a tetanic contraction of the uterus, also favors congestion of the fetal brain.

Symptoms and Prognosis.— The symptoms induced by meningeal extravasation depend, of course, upon the seat and extent of the effusion. The extravasation is frequently located over the motor convolutions, and if not extensive the hemiplegia may disappear with the absorption of the blood.

If more extensive, however, the infant may be stillborn or, if living, it may soon die from asphyxia or in a comatose condition. The voluntary muscles in such cases may be in a spastic condition, or more rarely, in a state of complete relaxation. The respiration is more apt to be depressed and irregular than the pulse. Convulsions may occur shortly after birth, followed by coma. If death does not ensue the prognosis for the extremities affected is good, as the paralysis gradually improves, often undergoing complete recovery. The brain, however, may be irreparably injured, as shown by subsequent epilepsy or even by various degrees of idiocy.

Treatment.— The treatment must be preventive. This consists in avoiding as much as possible prolonged pressure upon the fetal head, in a careful use of the forceps, and in seeing that the infant cries immediately after birth, thus being assured that the lungs are inflating. It is of great importance that the transition from the fetal to the post-natal circulation should at once take place at birth, as otherwise great damage may be done, particularly to the brain; the vessels here are fragile and easily ruptured. If the infant cries the expanding lungs draw off the excess of blood that may do damage elsewhere. The physician should give his first attention to the infant until this happens, as a short period of asphyxia may do incalculable harm. If the lungs do not act, it is well to let the cord bleed to the extent of a few drams to prevent severe congestion of other vital organs.

Asphyxia.

The accidents during labor that induce asphyxia are: sudden death of the mother, constant pressure upon the umbilical cord, severe compression of any part of the fetal body, especially the head, as noted above, and more or less complete detachment of the placenta. In consequence of the air-hunger induced by these conditions, a vigorous infant may by inspiratory suction take in secretions of the birth-canal, which may cause suffocation after birth or induce pneumonia later. Very feeble infants may fail to establish respiratory movements after birth, owing to weak or defective muscles and nerves. In partial asphyxia there is congestion and suffusion of the skin, with blueness of the mucous membranes, full pulse, and moderate action of the reflexes. As the symptoms of carbon-dioxid poisoning become more marked, the pulse grows feebler, the skin paler, and the mucous membranes assume a grayish-blue color. The reflexes are likewise lost. The prognosis in the latter condition is exceedingly bad. In the milder degrees of birth-asphyxia recovery usually ensues.

The Preventive Treatment consists in measures addressed to the acceleration of tedious labors and the prevention of prolonged pressure upon the fetal parts, especially the head. During descent of the head malpositions of the cord, especially prolapse, or winding tightly around the neck, must be looked for and, if possible, corrected. One of the possible causes of asphyxia will be removed if as soon as the head is born it is so turned that the face shall not lie in a pool of blood and liquor amnii. At the same time the mouth and fauces can hastily be cleaned of mucus with a moist rag drawn over the finger or by means of a soft rubber tube with a rubber bulb attached. In moderate degrees of asphyxia the stimulus of the cool external air and allowing a dram or two of blood to escape by the cord will be sufficient. Should this not suffice the chest may be sprinkled with cold water to stimulate the reflexes, while the infant is held suspended by the feet for the purpose of allowing mucus to gravitate from the air-passages. The child may be plunged alternately into hot and cold water. The hot water should have a temperature not exceeding 105° F. When these external stimuli fail to excite respiratory movements, resort must be had to artificial respiration.

The child's pharynx should first be cleared of mucus and other liquid material that may have been drawn into it by premature efforts at respiration. The simplest and most effectual method of inflating the lungs is by direct insufflation — the mouth-to-mouth method. In hospitals the lungmotor regulated to suit the respiratory capacity of the infant is used.

Direct Insufflation.— The child is placed upon its back with the head extended by means of a small pillow or roll of clothing placed under its neck: the mouth is well cleansed and a towel or handkerchief is spread over the face. With one hand closing the nose, and with the other making pressure upon the epigastrium, to prevent the inflation of the stomach, the physician forces air from his own gently into the child's mouth and inflates the lungs. The air is expelled by gentle pressure upon its chest, and the process then repeated. When properly performed, this method is safer than passing a catheter or other instrument into the trachea, as is sometimes practised. Care should be taken lest injury be done to the air-cells by too forcible expansion.

Various methods of artificial respiration may be employed. Schultze's method is most commonly employed. The operator holds the infant suspended, face to the front, his index-fingers being hooked in the axillæ, the thumbs resting on the front of the chest and the fingers upon the infant's back. The lower portion of the child's body is now swung outward, upward, and finally toward the operator's face, inverting the position. Care should be taken that the trunk is most strongly flexed in the lumbar region. In this position the thorax is compressed — *expiration*. The child's lower extremities are now swung outward away from the operator's body and downward till the child hangs suspended by its axillæ in the position first described. In this position of the child, hanging by its upper extremities, the abdominal contents fall and the diaphragm sinks — *inspiration.* To assist the respiratory movements the pressure of the operator's thumb is relaxed during inspiration and increased during expiration. This method is not to be recommended in feeble children.

Laborde's method is easy to apply in the case of very feeble infants. It consists in making rhythmical traction upon the tongue, eight to ten times to the minute.

After the respirations have been started, the infant must be watched to see that they continue. It may be advisable in some cases to administer hypodermatically ten to twenty drops of whiskey combined with 1 minim of the tincture of belladonna or 1/200 grain of strychnin. In most cases it will be necessary after resuscitation to apply heat by a hot-water bag or other means. In asphyxia pallida a rectal injection of water at a temperature of 110° F. is of marked service.

Congenital Atelectasis.

Closely allied to asphyxia, and often associated with it, is a persistence of the fetal condition of the lungs, either of one or both in whole or in part. It is due to failure of the infant to completely inflate the lungs, and may persist for a considerable time. Sometimes it results in death, even after respiration has apparently been fully established.

This is more apt to involve the lower lobes than the upper ones. It is frequently seen in premature infants with feeble respiration. The cause may also be injury to the brain from pressure. The symptoms are those of deficient respiratory action, such as pallor, feeble cry, and poor circulation, with very little expansion of the chest-walls over the affected area. Deep inspiration may be encouraged by artificial respiration, and the vitality conserved by the external application of heat and the judicious administration of nourishment and stimulants.

Fetal Death.

Death may take place at or before birth, which must sometimes be differentiated from asphyxia. In the former the heart pulsations cannot be felt and respirations and reflexes are absent. In the latter the heart is pulsating, reflexes are present, and there may be feeble attempts at respiration. We should not refrain from efforts at resuscitation because the heart-sounds are absent or no pulsations can be felt in the precordial region. The distinction between a dead-born and a still-born infant can usually be made by the rapid fall of rectal temperature in the former to ten or fifteen degrees below normal and by the widely dilated condition of the pupils in the dead-born. In the still-born, artificial respiration may be employed, and the hypodermatic injection of a few drops of whisky and gr. 1/200 of sulphate of strychnin may be given.

CHAPTER III.

DISEASES OF THE NEWLY-BORN.

Acute Infectious Disease.

While the newly-born infant seems to bear a sort of natural immunity to the common infectious diseases of childhood, it is possible for an infant to be infected through the placenta before birth or by the usual methods soon after birth. While the symptoms of measles, pertussis, pneumonia, scarlatina, or influenza are largely the same as when seen later on, the prognosis in the newly-born is bad.

Sepsis of the Newly-born.

An infection induced by pus-forming organisms such as the streptococcus pyogenes and the staphylococcus pyogenes aureus and albus may be seen in the newly-born. The umbilicus is the most vulnerable spot for the entrance of septic poisons during or shortly after birth. Upon ligation of the cord the blood that remains in the umbilical veins forms small thrombi that should gradually harden and in time become calcified, forming a fibrous cord in the same manner as in the ductus arteriosus and ductus venosus. In these latter structures the formation of thrombi is never accompanied with grave consequences, since their internal situation prevents the access of infectious agents. Pyogenic organisms, however, can readily gain access to the umbilical vein and give rise to umbilical phlebitis and septicemia.

There is a constant alteration after birth in the blood-pressure in the umbilical vein, due to the action of the heart and lungs, by which a sort of flux and reflux is produced. This favors infection of the system when the contents of this vein become septic.

This grave accident is liable to occur when the mother is in a septic condition. The poison may be produced by the same agents that have caused the puerperal fever. In these cases of sepsis there is a puriform or yellow softening of the thrombi that fill the umbilical vein. The softened matter consists of pus-corpuscles and finely granular matter containing micrococci. This sets up an inflammation not only in the vessel itself, but also in the surrounding tissues. Infective emboli may be carried to various parts of the body. As the micrococci enter the umbilical vein from the umbilical fossa, owing to the perviousness of this vessel, the structures near at hand, especially the liver, bear the first brunt of the septic inflammation.

The latter organ is usually found much diseased or degenerated. There is jaundice, with constant elevation of temperature and other symptoms of general septic infection. If the infant lives long enough peritonitis will probably develop, and sometimes empyema, pleuropneumonia or even meningitis. In all cases evidence of severe illness and prostration are present. Cutaneous, mucous, or visceral hemorrhages may supervene at any time. The abdomen is generally swollen and tender, and dirty-looking pus may be seen oozing from the navel; slight pressure about the umbilicus will often cause pus to exude if it is not otherwise apparent. The fecal discharges may be of natural appearance, but the urine is usually highly colored. The infant refuses nourishment, and there may be vomiting of greenish matter. Severe nervous symptoms, such as convulsions or coma, supervene before death. While the umbilicus is the most common seat of septic infection, any sore or abrasion elsewhere may afford entrance to germs. Erysipelatous eruptions on the abdomen, chest, or other parts, are the most frequent manifestations of such infection.

Multiple joint inflammation and suppuration may appear as evidences of a general pyemia, and a few cases of osteomyelitis have been reported.

Treatment.— The prophylactic treatment of sepsis consists in the careful antiseptic management of labor and proper attention and cleanliness in reference to the navel. Localized sepsis may be combated by the topical use of peroxid of hydrogen, bichlorid of mercury solution, or other strong antiseptic agents.

The remedial treatment of systematic infection consists in full stimulation and general support and the judicious use of external refrigerant measures. In the latter condition, however, treatment is generally futile. Empyema, pleuropneumonia, erysipelas and any other local effect of infection must be treated symptomatically.

Umbilical Hemorrhage.

Hemorrhage may take place from the stump of the cord shortly after birth from insecure ligation, from shrinkage of the funis, or from slipping of the ligature. Laceration of the cord between the abdomen and the ligature may also be responsible for hemorrhage. Secondary hemorrhage, usually between the fifth and fifteenth days, may occur, even though the cord has been securely ligated and properly watched. The trouble may be due to changes in the walls of the minute blood-vessels, allowing transudation, or to imperfect coagulability of the blood. In the latter case the hypogastric artery and the umbilical artery and vein have not been tightly occluded by the usual fibrinous plug. The hemorrhage is accounted for by syphilis, jaundice, hemophilia, or by depraved health on the part of the parents.

Treatment.— The great majority of cases are fatal from the impossibility of controlling the hemorrhage. In the milder ones a compress of gauze tightly applied with adhesive strips may be sufficient.

Adrenalin (1/1000) may also be used to moisten the compress. In the most obstinate cases it may be necessary to transfix the umbilicus by two needles placed at right angles with a figure-of-eight ligature placed tightly around them.

Umbilical Vegetations.

Fungous granulations at times appear, arising from the floor of the umbilical fossa, shortly after the falling of the cord. They may attain the size of a pea, and they usually exude a bloody serum, which may induce excoriations in the surrounding skin. The granulations may gradually atrophy after weeks or months of sluggish existence. The constant moisture and discharge is, however, a source of irritation, and it is best to destroy the growths. This can be accomplished by repeated cauterization with the solid stick of nitrate of silver or, better still, by passing a ligature around the base of the mass and amputating the exuberant granulations with scissors. A dry dressing of boric acid or subgallate of bismuth may then be applied.

Umbilical Hernia.

There is a tendency, especially on the part of badly-nourished infants, for the gut to protrude a little at the umbilicus. It is hence desirable to keep a firm abdominal binder in place for the first two or three months. After this time if a protrusion persists, the hernia may be retained by long strips of adhesive plaster. It may be necessary to keep up this support for several months. The dressing may be examined and changed every few weeks to be sure the pressure stays in the right place. The skin must be kept scrupulously clean and frequently dusted with powder. In older infants, an abdominal truss may occasionally do good service. It is rare for this form of umbilical hernia to last through childhood. In exceptional cases when the rupture increases rapidly in size operative interference may be considered.

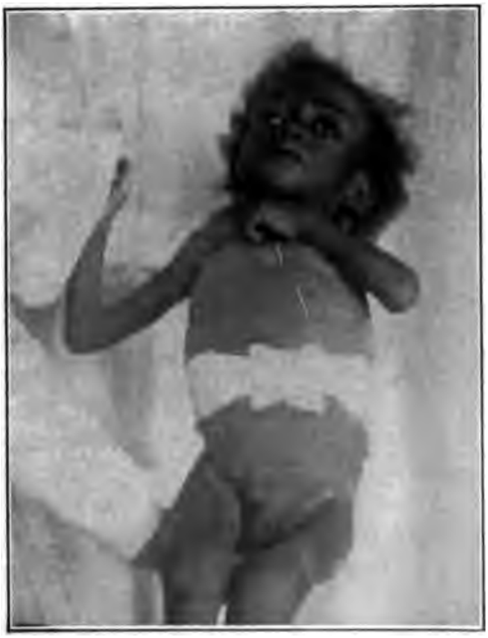


FIG. 5.—Adhesive plaster dressing for umbilical hernia, made with two pieces overlapping. (*Pisck's method.*)

Epidemic Hemoglobinuria.

(*Winckel's Disease.*)

This form of hemoglobinuria is very rarely seen in the newly-born and then usually in institutions. It begins a few days after birth in healthy infants with constitutional symptoms of depression shown by a weak rapid pulse and general asthenia. An icterus soon develops that becomes very marked and is noted over the whole body. The urine is soon lessened in amount, contains traces of albumin and hemoglobin in large amounts. Casts are occasionally also found. The color of the urine may be dark or smoky. The disease progresses rapidly, often terminating in one or two days. There may be marked cyanosis with convulsions or coma before the close of life. The disease is evidently an outcome of some sort of infection, but the microbe has not yet been isolated. Treatment does not seem to be of much avail.

Fatty Degeneration of the Newly-born.

(*Buhl's Disease.*)

This is a very rare disease that acts like some form of pyogenic infection. It is characterized by fatty degeneration of the heart, liver, and kidneys with hemorrhages from any of the mucous membranes or into the various serous cavities or viscera. The spleen and liver are both usually enlarged. The disease is accompanied by great prostration and may last one or two weeks. Icterus may be present. The treatment is supporting and symptomatic, but not able to save life.

Icterus Neonatorum.

This is a common affection of the newly-born. Two distinct varieties are recognized, differing widely in cause and prognosis and known as the mild and grave forms.

(*a*) Mild Form.—Two divergent theories have been advanced to account for this form. The first considers the jaundice to be purely hematic; the second theory regards it as hepatic in origin. Bile is first formed in the liver and then carried into the circulation, the resorption being due either to congestion or to edema of the hepatic tissue. It seems highly probable that both these theories may apply in different instances, and doubtless many cases of icterus neonatorum are to be satisfactorily explained only by taking into consideration a morbid condition of both the blood and the liver, thus combining the hematic and hepatic theories.

The intense congestion of the skin observed during the first few hours of life often produces a yellowish coloration that cannot be considered jaundice. It is of the same nature as the discoloration of the skin following an ordinary cutaneous bruise. The yellow tint is at first seen only on deep pressure, but as the erythema fades the yellowness increases. The conjunctivæ are not colored, and the urine appears normal. This yellowness is usually first noticed on the second day, and may continue a few days or a week.

The term "true icterus" can be applied only to those cases in which the yellow discoloration of the skin is caused by a staining by the b ments. This more often occurs in cases of prolonged or difficult labor, in children born asphyxiated or before term, and in generally feeble infants. It is very frequently seen in foundling asylums. It may appear as early as a few hours after birth, but usually is not marked until the second or third day. In very mild cases the yellow color may appear only on the face, chest, and back, the conjunctivæ being but faintly tinted and the urine and feces normal in appearance. In severer forms the urine may be high colored enough to stain the linen, and the jaundiced hue may extend to the arms and abdomen. Some infants present a yellowish discoloration of the whole body, with typical clay-colored stools. In most cases the jaundice has disappeared by the eighth or tenth day. It may persist for several weeks. In rare cases, after having much diminished, it reappears with renewed intensity. No matter how extensive this form of jaundice may be, it causes very little constitutional disturbance. The liver may be slightly enlarged, and occasionally there are symptoms of intestinal indigestion. A few small doses of calomel or mercury with chalk will be all the medication required.

(*b*) GRAVE FORM.—This form is fortunately rare, and may be produced by several different conditions. Defects in the bile-ducts will first be mentioned as among the commonest causes. In some cases all the large bile-ducts have been absent; in others the ductus communis choledochus has been narrowed, obliterated, or entirely absent. Sometimes a fibrous cord has been found in place of the gall-duct. The cystic duct has been absent and the gall-bladder in a rudimentary condition. Accompanying an obliteration of the gall-ducts cirrhosis is usually found in the liver, which will be more or less marked, according to the length of time the infant survives. The liver is generally enlarged. Jaundice that is due to obstruction or obliteration of the biliary passages may appear a few hours after birth and soon acquire a marked intensity. It often, however, does not appear for one or two weeks after birth. The yellowish discoloration of the skin may vary from day to day, at times being much more intense than others. The conjunctivæ are yellow. The fecal discharges lose color and have an offensive odor, while the urine stains the napkin a yellow or greenish-brown. The spleen, as well as the liver, is usually enlarged, which partially accounts for the increase in size of the abdomen. Umbilical hemorrhage is a grave and not infrequent symptom in this form of jaundice. The bleeding is not sudden and profuse, but begins as an oozing shortly after the separation of the navel string. It is apt to commence at night. Death is always hastened by this accident, and exhaustion from loss of blood is added to that induced by indigestion and malassimilation. There may also be a species of general purpura, bleeding taking place from the nose, mouth, or stomach. Infants may live for several months with impervious or defective bile-ducts, though death usually takes place earlier from failure of nutrition.

Another form of grave icterus neonatorum is observed in connection with certain inflammatory changes in the liver, usually taking the form of an interstitial hepatitis, with which may be conjoined inflammation of the biliary canals. This lesion is apt to be one of the results of congenital syphilis, as is likewise perihepatitis, which may cause a complete obliteration of the biliary passages. The latter form of inflammation often involves the connective tissue surrounding the common duct, the portal vein, and the hepatic artery on the under surface of the liver. These cases, however, may not always be of syphilitic origin. Perhaps the commonest manifestation of the grave form of icterus in the newly-born is seen in connection with septic poisoning that is generally accompanied with phlebitis. This has been noted under the head of sepsis. Later researches seem to prove that the bile itself may carry the infective agent.

Tetanus Neonatorum.

Although this disease is distributed through a wide geographical area, it is most apt to be found in filthy surroundings. Something beside filth, however, is necessary; there must be a specific cause. This consists in the tetanus bacillus, sometimes called Nicolaier's bacillus which produces tetanotoxin, a most virulent poison. It may exist in straw or dust from hay, which explains the fact that horses are subject to tetanus and that traumatic tetanus is often seen among laborers who are employed about farms and stables.

The disease usually begins during the first ten days of life, and the onset is apt to be preceded by great fretfulness. Disinclination to nurse is soon followed by rigidity of the voluntary muscles, usually starting in the masseters. The rigidity increases, reaching its maximum in from twelve to twenty-four hours. The head is thrown back, and there is a general flexion of the extremities. One peculiarity of the disease is that while the toes are flexed the great toes are adducted. There may be some relaxation at times, especially during sleep, but there are constant exacerbations, provoked by any peripheral irritation. Respiration and circulation may be extremely embarrassed, and opisthotonus may be present during these exacerbations.

The temperature is irregular, but usually high. Toward the end the pulse becomes rapid and feeble and death takes place from exhaustion.

Treatment.—While the specific cause of the disease may gain entrance at any point of the body when the necessary lesion exists, the umbilical wound is undoubtedly the seat of infection in the great majority of cases of tetanus neonatorum; hence the utmost cleanliness must be observed in cutting the cord and in dressing it. The scissors, the ligature, and the entire management of the navel, cord, stump, and the umbilical wound must be rigidly aseptic. The excess of the gelatinous matter should be stripped from the cord, and a dry, antiseptic dressing applied. Speedy mummification of the stump is the best safeguard against infection. Special care must be exercised in the umbilical dressings where the dwelling is easy of access to stable-yards containing horse-manure or loose earth.

When the disease is once established it is almost invariably fatal. In cases of suppuration at the umbilicus, frequent cleansing with a solution of mercuric bichlorid of suitable strength should be employed. With reference to drugs, the two most valuable are potassium bromid, gr. iv every two to four hours, and chloral hydrate, gr. j every hour. The extract of calabar bean from 1/10 to 1/12 grain may be given hypodermatically. While these are administered the infant must be given nourishment frequently, and stimulants should be freely employed. The difficulty of swallowing, however, is a source of embarrassment in satisfactorily carrying out these measures. Nourishment may be given by the rectum or by a nasal tube. A tetanus antitoxin is now produced by several manufacturing chemists, but so far the experience reported in the serum treatment of tetanus neonatorum has been rather negative.

Conjunctivitis.

The conjunctival membrane in the newly-born is very sensitive, and frequently the seat of inflammation. A mild inflammation is often seen, unattended by swelling of the lids, the inner surface being reddened and covered with a slight viscous secretion. The eyes must be kept cleansed by frequent bathing or irrigation with a saturated solution of boric acid. A little sterile vaselin may be applied to the lids to prevent retention of the secretion by adhesion of their edges.

Ophthalmia Neonatorum.

This form of purulent conjunctivitis may be due to infection by the gonococcus in the severer cases or by various pyogenic cocci in the milder ones (Koch-Weeks bacillus). If the disease manifests itself by the second or third day, the infection probably took place during birth. When there is a delay of a week or more, however, the virus has probably been conveyed by careless attendants, by soiled fingers or other infected objects. The inflammation is of an intensely virulent type, involving both the ocular and palpebral conjunctivæ. The sac is filled with a grayish mucopurulent secretion, and there is intense chemosis. The subconjunctival connective tissue and skin are much swollen, so that the eye can only with difficulty be opened. There are photophobia, pain in the eye, and rise of temperature. Unless the symptoms quickly subside, the eye is irreparably damaged by ulceration and partial destruction of the cornea. The inflammation begins in one eye, but soon attacks the other unless it is effectively protected. The diagnosis of the various forms may be made by culture or by direct smear; the latter alone will disclose the gonococcal form; a smear at least should be made in every case.

The Prophylactic Treatment consists in employing antiseptic vaginal douches in the parturient woman when there is any mucopurulent discharge, and dropping two or three drops of a 2 per cent. solution of silver nitrate into each eye of the infant immediately after birth, after the method proposed by Credé.

Curative Treatment.— When the inflammation has actually begun the eye must be kept as free of pus as possible by constant washings with a saturated solution of boric acid. The swelled and puffy lids should have applied to them every few minutes gauze compresses that have been kept upon a cake of ice, and the pus must be removed every hour or two. Constant cleansing and cooling of the surface will require the services of a careful nurse night and day. A 2 per cent. solution of nitrate of silver or of bichlorid of mercury, one or two grains to the pint, may be instilled between the lids every two or three hours, according to the severity of the case. As this affection so frequently results in blindness, it is well, if possible, to have the advice of an oculist. Protargol in 5 per cent. or argyrol 10 per cent. solution can be recommended as a substitute for nitrate of silver. It has the advantage of being less painful, and is equally efficient.

If the disease is limited to one side an effort should be made to protect the sound eye from infection by applying a compress moistened with an antiseptic. The pupil must be dilated with sulphate of atropin if the cornea is attacked.

Mastitis.

The mammary glands of the new-born infant often secrete a milk-like substance, which appears between the fourth and tenth days after birth. During this time there may be swelling of the glands, which gradually abates with the subsidence of the secretion until, usually by the twentieth day at the latest, both secretion and swelling have disappeared. In some cases, however, the glands may remain engorged and tender, and suppuration ensue. This implies infection, and is exceedingly rare when proper antiseptic precautions have been observed during and after labor.

Treatment.— When there is simple swelling the parts may be cleansed with soap and water and bathed with a weak antiseptic solution, either of carbolic acid or bichlorid of mercury. Gentle support with absorbent cotton and a bandage will also be indicated. If, in spite of this, suppuration occurs, there will be rise of temperature and the local signs of abscess. Then early incision, under proper antiseptic precautions, constitutes the treatment.

Sclerema Neonatorum.

This rare condition consists of an induration of the skin and subcutaneous fat. The hardening may be present only in patches or involve all of the body. It may occur in the calves of the legs, in the thighs, buttocks or parts of the back. Sometimes the cheeks are principally involved. The skin may be lobulated or raised in ridges over the circumscribed patches. The part affected feels as hard as a board, and when the limbs are involved they become stiff and unyielding. In some cases the whole body becomes affected, then having almost the appearance and feeling of a cadaver. The skin feels hard and cold and does not pit on pressure as in edema. The capillary circulation is very sluggish which gives a bluish tint to the lips and nails. The coldness of the body is caused by a subnormal temperature. The pulse is feeble and the respiration slow or irregular. The prognosis is bad where the hardening is at all extensive, the infant dying of exhaustion in a few days. In milder cases, where only a few patches occur, such areas of induration may gradually disappear and recovery take place. The disease is apt to affect premature infants or those who are feeble and with low vitality from any cause. The treatment consists in conserving animal heat and doing everything to promote the general nutrition. The cotton jacket may be employed and hot water bottles kept in the crib. Stimulation by hypodermics of camphor or caffein may be employed where there is much blueness from a feeble heart or atelectasis.

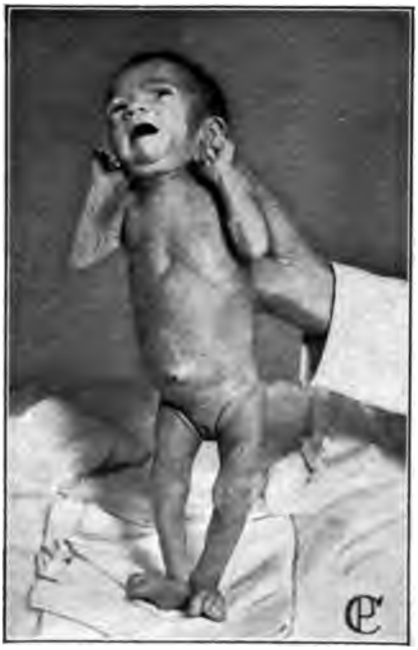


FIG. 6.— Sclerema Neonatorum.

Spontaneous Hemorrhages in the Newly-born.

In addition to the accidental hemorrhages during the process of delivery caused by pressure effects, we may occasionally have spontaneous hemorrhages during the first week of life that are independent of birth. These hemorrhages may occur in connection with various forms of sepsis, with congenital syphilis or from unknown causes. A general predisposing cause doubtless exists in the great alteration in the circulation induced by the transition from fetal to extrauterine life, from the rapid changes taking place in the blood at this time, and the fragile state of the walls of the blood-vessels. The blood may ooze from the mucous membrane of the nose, mouth, gastrointestinal tract, umbilicus, or vagina. The skin may also be affected, especially at the occiput, along the back and wherever pressure is apt to be exerted. There may likewise be small extravasations in the various viscera, but these are not usually recognized during life. The hemorrhage takes the form of slow, continuous oozing and is not apt to last more than one or two days. While the actual loss of blood may not be great, a large number of the cases die from exhaustion, as losses of blood are not well tolerated at this time. The bleeding is apt to start from the intestinal tract, called melena neonatorum, when the infant may be restless or somnolent, with bloody stools, and occasionally vomits hemorrhagic masses. The umbilicus may begin to show oozing a few days later and hematuria is sometimes noted. Where the hemorrhage is limited to the nose, congenital syphilis is probably the cause. While the etiology of some of these cases is obscure, the condition is different from hemophilia, and the hemorrhages usually stop spontaneously in a few days.

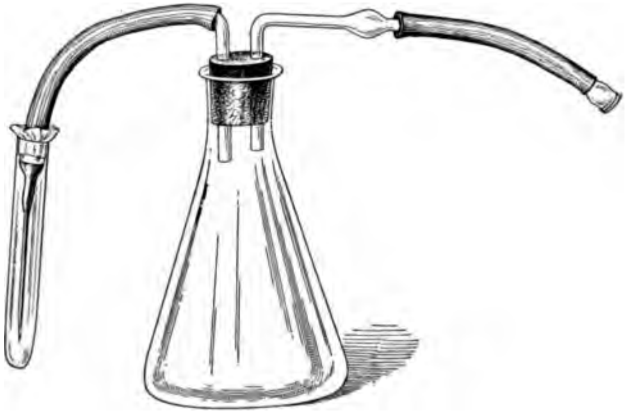


FIG. 7.— Flask for collection of blood serum.

Unless immediate treatment is instituted the prognosis is bad, the infants succumbing to exhaustion. The treatment consists in trying to keep up the strength by careful feeding and stimulation and by employing adrenalin in connection with the bleeding surfaces when they can be reached. The recent work of Dr. John E. Welch, however, has yielded brilliant results. His treatment consists in the subcutaneous injection of normal human blood serum, 10 c.c. three times a day, and, in severe cases, every two hours, starting at the very beginning of the hemorrhage. The technic of collecting the blood is as follows:

The arm at the bend of the elbow should be made surgically clean. Iodine for this purpose is not very satisfactory, as it tends to conceal the faint blue coloring of the veins, making it difficult or impossible to find them. A muslin bandage or a piece of rubber tubing is drawn around the arm just above the elbow sufficiently tight to cut off the venous circulation but should not entirely obliterate the pulse. The most prominent vein in the forearm or at the bend of the elbow is chosen and a rather small sized aspirating needle connected to the previously sterilized apparatus quickly pushed into it, the point being opposed to the direction of the current. If the needle is in the lumen of the vessel there is a fairly rapid flow of blood. As soon as a flow of blood is established the constricting bandage is removed or loosened.

The needle should be connected by means of a rubber tubing to a flask (Ehrlenmeyer flask). A partial vacuum may be obtained by suction through a second tube. The glass connection of the aspirating tube should be lightly plugged with cotton in order to prevent contamination.

When the flask is filled with blood to the desired level it is stoppered with cotton and allowed to stand at room temperature for one or two hours; and then is placed in an ice chest for ten or twelve hours. This allows the blood serum to separate from the clot. At the end of this time the serum is drawn up into sterile pipettes (the mouthpieces of which are stoppered with cotton) and is then run into large test-tubes for preservation. Each test-tube is to contain one dose.

Injections of whole blood subcutaneously or transfusion of blood by the syringe canula method (particularly homologous blood) are measures which have recently saved many of these infants' lives. The donor selected should be healthy and his blood tested for any hemolyzing action before the transfusion is made.

Various diseases and affections that are often seen in the newly-born, but not confined to this period, will be discussed in their appropriate sections. Among these may be noted tuberculous infection, congenital syphilis, thrush or sprue, colic and indigestion, edema and pemphigus.

SECTION II.
HYGIENE OF INFANCY.

CHAPTER IV.

HYGIENE OF INFANCY.

After birth a careful inspection of the infant should be made to discover any defects that may be present. The body should then be thoroughly oiled, and, if the infant is cold or gives evidence of poor vitality, it may be wrapped in cotton batting and put in a warm place for rest. Vigorous children may be bathed in water at 100° F. shortly after the oiling and then dressed. The first bath must always be given expeditiously in a warm room. A dry dressing is best for the cord, which, after a thorough powdering, may be wrapped in sterile gauze. A daily sponging of the body with castile soap and warm water will take the place of the bath until after the cord separates. A pad of sterile gauze may be applied over the umbilicus for several weeks and kept in position by the abdominal binder.

The eyes can be cleansed with a saturated solution of boric acid or a 2 per cent. solution of nitrate of silver where a purulent vaginal discharge has existed in the mother. The mouth may be gently wiped out with boiled water and a teaspoonful of tepid water given to swallow.

Clothing.

The clothing consists of an abdominal binder of flannel, which, in a few months may be changed in vigorous infants to a knitted band with shoulder straps. The binder should not press so tightly as to retard the free expansion of the lungs in breathing. Next will come a shirt with a little extension below to which the diaper may be attached by pinning and then a flannel petticoat. Finally a dress of some light material will complete the raiment. Care must be taken to have the clothing neither too tight nor too loose. In the former case, the free movements of the chest, abdomen and legs are interfered with, while in the latter instance the clothing creases or works up and down in a manner to cause much discomfort. Long, warm stockings, with knitted bootees will keep the lower extremities protected in cold weather, and in the warm season, short, thin socks may be substituted. In early infancy the clothing is made long enough to well cover the feet, but it is not necessary to have dresses and petticoats unduly long so as to drag on the feet. The Gertrude patterns are excellently adapted to the dressing of infants as the several pieces may be put on at one time, obviating unnecessary handling. Diapers may be made of linen, cotton, stockinet, or canton flannel, according to the season, care being taken to have them snugly applied and warm. Watchfulness of the nurse is required to have them quickly changed after being soiled.

The Nursery.

This should be a large well-ventilated room with a sunny exposure. The temperature should be kept constant — from 68° to 70° F. during the day and night from 65° to 55° F., according to the age and vitality of the infant. An intake of fresh air without a draft may be accomplished by fitting a board under the lower window sash. If possible heat the room with an open fire on account of the ventilation. When furnace heat is employed, a thorough airing twice a day by widely opened windows is desirable.

Bathing.

After the cord has separated, a daily bath may be given. For the first six months the temperature of the water may vary from 98° to 100° F.; from six to twelve months, 95° to 98° F., and after one year it may be as low as 90° F. A good grade of soap — French or castile — may be used, and the lather removed by plunging the infant in the water. The skin must be thoroughly but gently dried without undue friction, and the folds of the skin and genitals powdered. The prepuce is to be retracted to prevent the collection of smegma. Finally, the eyes and mouth may be cleansed with a warm solution of boric acid. When the skin is thin and irritable, or the seat of eczema, bran baths may do well. In severe cases of eczema, the skin may be cleansed by rubbing with sweet oil or vaselin.

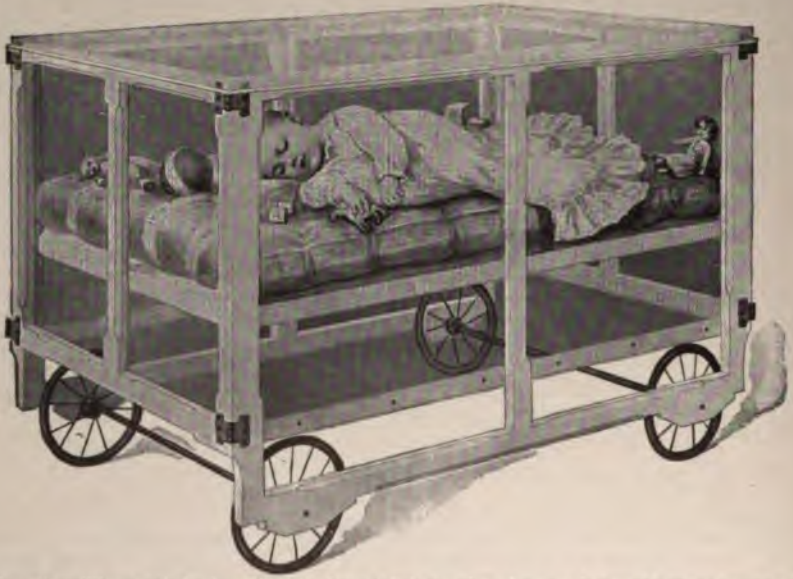


FIG. 8.— The cariole is suitable for out-door sleeping and a safe play-place in daytime.

Exercise and Fresh Air.

When awake, the infant should not be allowed to lie continuously in its crib, as the gentle exercise of being held or carried about is beneficial. They should always be taken up for feeding. The arms and legs must not be so constricted by the clothing as to prevent easy movements and, when undressed, a little time for free play of all the muscles is beneficial. In warm weather, the infant can be taken out of doors as early as the second or third week, in spring and fall at from four to six weeks, but if born in winter, unless the weather is mild, it may be wiser to give it its airings in the house until spring. In cold weather it is best to give the outing between 10 A. M. and 3 P. M. when the sun is out, but the face and eyes must be carefully protected from the sun's rays. Never expose an infant to wind. When the temperature of the air is below 30° F. it is better to stay at home, except in the case of very strong infants. The baby can sleep out of doors, but care must always be taken to see that it is sufficiently warm during the winter months. In very cold weather or when there is melting snow, the infant may get fresh air by being warmly clothed, put in a room with a sunny exposure and have the window opened. The room must then be otherwise closed to prevent a draft. It is possible in this way to avoid the dust of the streets in windy weather. It is likewise safer to take the fresh air in this manner in damp, foggy weather when there is no sun.

General Habits.

It is well to start early in training the infant to habits of regularity. Sleep is encouraged by putting the infant in its crib with a firm mattress, but with the head low, resting on a folded pad, darkening the room, and attending to proper ventilation. Rocking as a preliminary or accompaniment of sleep is undesirable. If feeding-time comes during sleep the infant can be awakened for this purpose, as he will usually sleep again after nursing or learn to wake at the proper time. The nurse need not hasten to take a baby up the moment it arouses and cries, as it will frequently go to sleep again after a few moments of restlessness. During wakeful hours, and especially late in the day, the infant must not be excited by too much playing and attention, as this induces delayed and disturbed sleep. The very young infant should sleep most of the time, from eighteen to twenty-two hours daily during the first months. At six months the baby usually sleeps two-thirds of the time, and at one year over half the time.

Much can usually be accomplished by an early training of the bowels. As early as the third month the infant can be placed at regular times on a small commode for this purpose, taking care to support the baby in the proper position. At a year, efforts may be made to train the bladder by encouraging the young infant to indicate his desire for urination. After many trials progress will be made in this direction.

The greatest regularity in feeding must be entailed from the first, but the necessary details will be considered in the chapter on feeding. Water must always be regularly given, even the newly-born getting a few teaspoonfuls daily.

The young infant must always be kept quiet, as the rapidly growing nervous system suffers from romping and too much attention. This must especially be enforced late in the day.

CHAPTER V.

WEIGHT AND DEVELOPMENT.

It is important to have a record of the birth weight in every case. The male infant usually weighs a little more than the female. In a series of 200 cases examined by the authors the males weighed from 6 to 8 pounds and the females from 5½ to 7 pounds. As many of these were born in institutions the averages of light weight were fairly large. Seven pounds may be considered a good average birth weight. As far as initial weight may be considered a gauge of vitality, 6½ pounds will show a good vitality, 5½ pounds a rather poor, and from 4 to 5 pounds a very poor vitality at the start. During the first few days there is generally a loss of from four to six ounces, after which there should be a steady gain. It must be remembered, however, that babies are apt to gain irregularly at short intervals. One day the infant may show a gain of an ounce and the next day a quarter of that amount while doing perfectly well. Again, the weight may remain stationary for a day or so, and then jump up two ounces in twenty-four hours. According to Rotch, there should be an average daily gain from birth to five months of 20 to 30 gm. (two-thirds of an onunce to an ounce), and from five to twelve months of 10 to 20 gm. (one-third to two-thirds of an ounce). This would mean an average weekly gain during the first five months of about four and a half ounces to seven ounces, and from five to twelve months of from about two and a half to four and a half ounces.

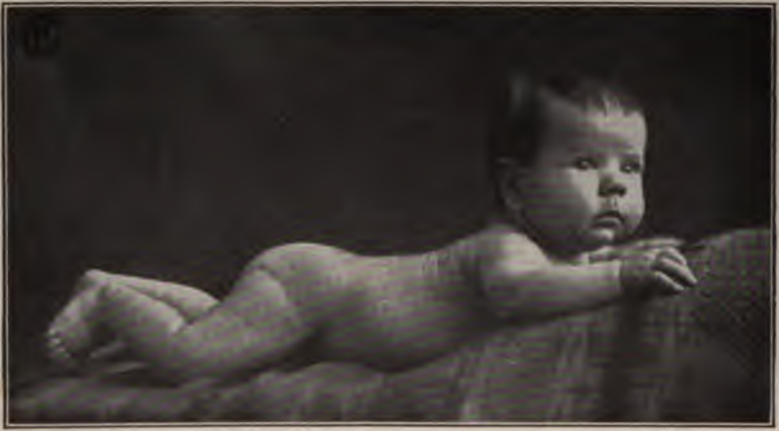


FIG. 9.—Normal infant at 3½ months. Typical attitude on ventrum.

The infant should double its birth weight at five or six months, and treble it at twelve to fifteen months. The weighing should be done by the same person either on grocer's scales or those lever scales specially constructed for infants. Daily weighings are deceptive and undesirable. During the first six months, once a week is sufficient, and, in the second six months, once in two weeks is often enough in cases that are doing well. Careful records should be kept, and charting is convenient for reference.

The length of the new-born baby is slightly greater in the male than in the female. In the series already noted, the males averaged 50 cm. (19.6 inches) and the females 48.6 cm. (19.1 inches). In private practice, with healthy parents, the length will average about 20 inches. Growth in length is most rapid during the first month, a little less so during the second, the rapidity decreasing with each month. The following figures are taken from Rotch: The average increase for the first month is about 4.5 cm. (1¾ inches); for the second month about 3.0 cm. (1½ inches); for the third to the fifteenth month about 1 to 1.5 cm. (½ to ¾ inch); for the first year about 20 cm. (8 inches); for the second year about 9 cm. (3½ inches); for the third year about 7.4 cm. (3 inches).

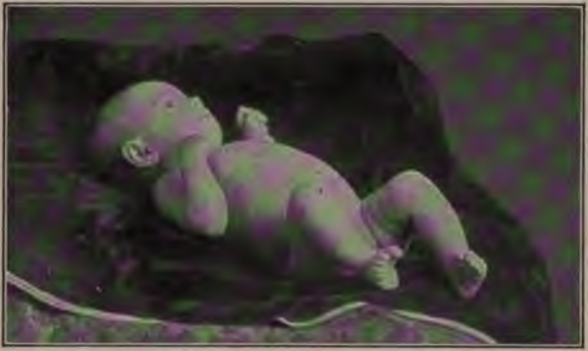


FIG. 10.— Normal infant. Typical attitude on dorsum.

Just after birth the trunk, arms, legs, and head have peculiar conformations. The body is of an elliptical shape, with the widest part at about the center over the liver, in the region of the lower ribs. The two ends of the ellipse, represented by the thorax and pelvis, are small and not well developed. The arms are stronger and better developed than the legs. During intrauterine life the baby is placed in a sort of squatting position with the legs drawn up and curled inward. This explains why the legs of the young infant are not straight, but show a decided bowing of the tibia and fibula. The soles of the feet also tend to point inward. The head is larger than the chest at this time, with a very short neck, and the baby assumes a position of general flexion.

While infants at birth may vary in size, each individual should develop in proper proportion, the various parts of the body bearing a symmetrical relationship to one another. The circumference of the head is greater than the circumference of the chest at birth, and remains so up to the middle of the first year, when they begin to approximate in size; at the end of the first year the chest expands to a greater circumference than the head. If later than this time the circumference of the head remains greater than that of the chest, it is an indication of rickets or hydrocephalus. The schematic diagrams done in scale from 200 measurements will show to the eye the average relationships found at various ages.

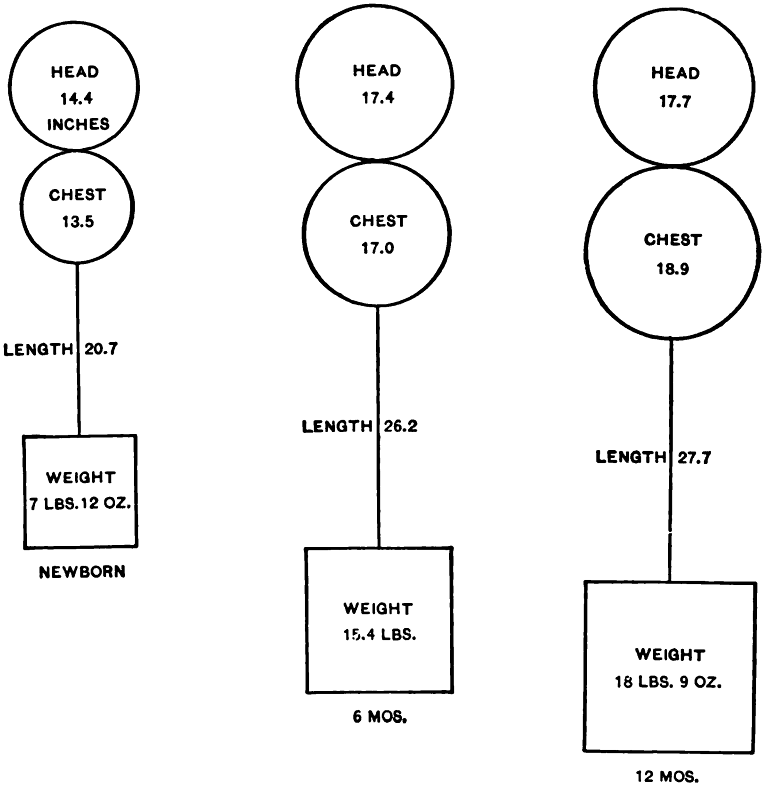


FIG. 11.— Diagrammatic table of relative measurements.

The Head.— The sutures of the skull should be ossified by the sixth month; the posterior fontanel closes at the end of the second month and the anterior fontanel from the sixteenth to the eighteenth months. Any deformities of the head due to prolonged pressure in difficult labors are usually overcome during the first few weeks. After birth and with increase in age, there is noted a gradual and steady enlargement of the great circumference of the skull, and, from this, of its estimated volume. Although no intellectual growth can be said to take place under two years, there should be an active evolution of the front of the brain, with increase of the perceptions. The first rapid growth of the brain after birth is more in bulk than

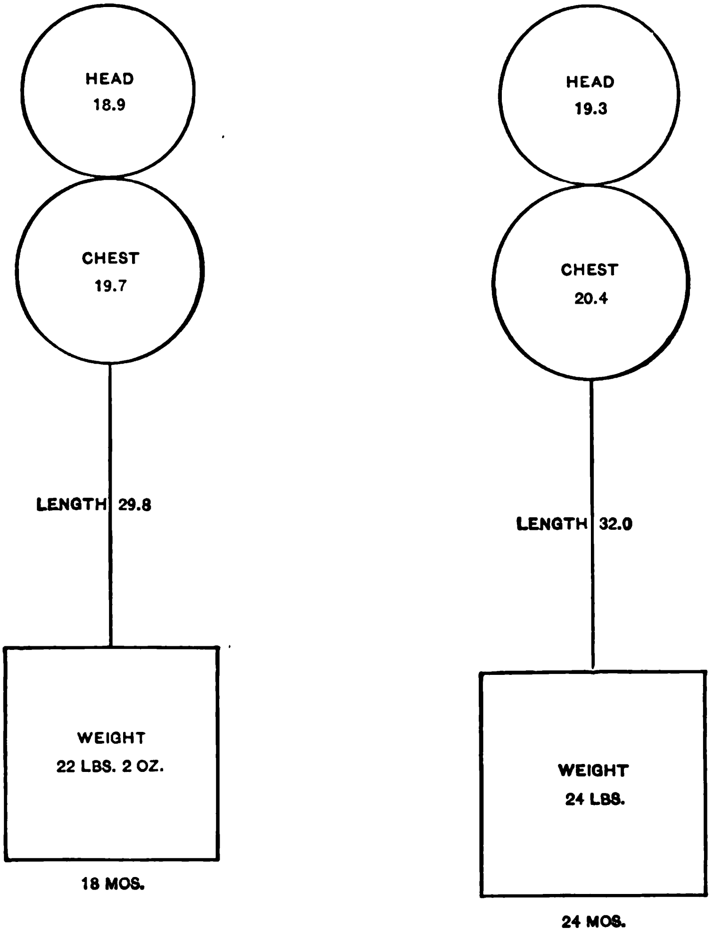


Fig. 12.— Diagrammatic table of relative measurements.

in the size and complexity of the convolutions. Hence in early infancy the higher centers have but a slight development and function. With proper evolution, the convolutions grow and become arranged in functional groups, which groups, by their growth, alter and modify the shape of the infantile skull. If the skull is small or improperly shaped in any part, the brain in such area is imperfectly developing. A certain amount of asymmetry is, however, found in all skulls as in other members of the body and, unless very marked, has no great significance.

The principle of biology that the development of the individual reproduces on a small scale the development of the race, is well shown in the infant's brain. The higher centers and the association fibers are developed late in the child; they are likewise the latest acquirements of the race. The lower and more fundamental animal traits are transmitted by inheritance in greater degree than the higher ones.

The skull changes considerably in its proportions during the first years of life, and then more slowly up to the end of the seventh year, when it has very nearly attained its full size. At birth, the circumference of the head averages from thirteen to fourteen inches, at the end of the second year about eighteen inches, at the seventh year about twenty and a half inches, and at the completion of growth twenty-two or more inches.

Just after birth the brain and nerve centers act only automatically, or by reflex action. Touch and taste are present at birth, but the baby is deaf for the first few days and it will not follow an object with its eyes until the third week. The eyes should never be exposed to bright lights. By the third month the baby reaches out its arms for objects and may recognize individuals. The rudiments of memory are now developed, and by the fourth or fifth month a few people may be remembered and recognized. It is not until the third year, however, that memory develops very rapidly. Efforts at speaking usually begin at the end of the first year when single words may be uttered. And at the close of the second year short sentences may be tried.

THE SPINE.— The spinal column is curved but very flexible. In early infancy the so-called normal curves are not developed above the sacrum, but there is one long curve in the shape of a convexity above the latter bone. With the strengthening of the spinal muscles, and when the child begins to stand and walk, the normal cervical, dorsal, and lumbar curves begin to develop. As the child grows older the spine becomes less flexible and more rigid with increased power in the spinal muscles. There is, however, much more flexibility all through childhood than in adult life: when the spine loses its mobility, and especially when it is stiff or painful on motion, caries may be suspected. At birth the spinal cord extends as far as the third lumbar vertebra, while in the adult the lowest portion of the cord is opposite the second lumbar vertebra. The spinous process of the fourth lumbar vertebra is about on a level with a line drawn between the highest points of the crests of the ilia.

GLANDS AND VISCERA.— The lacrimal glands are usually not developed sufficiently to shed tears for three or four months. The diastase-forming organs — the salivary glands and pancreas — act very feebly during the first two or three months. The sebaceous glands are early active, as seen just after birth in the vernix caseosa and later in dry seborrhea.

The thymus is large at birth, increasing slightly in size to the end of the second year and then remaining uniform in size until puberty, when it undergoes atrophy.

The stomach is somewhat like a vertical sac at birth, but gradually develops in a horizontal direction; the intestines are relatively long with a sigmoid flexure that is accentuated and with sharper curves than in older subjects. The intestinal muscles are weak, which explains the ease with which the bowel becomes distended with gas. The appendix is very long and narrow in lumen. The liver is large, reaching a little below the free margin of the ribs.

The bladder is well developed and usually extends up into the abdominal cavity on account of the smallness of the pelvis. In female infants the bladder may be mistaken for the uterus at autopsy. The testicles should be located in the scrotum at birth, but they may remain undescended in the abdomen or caught in the inguinal canal.

THE MUSCLES.— In the musculature, the greatest relative strength is shown in the hands and arms for a time after birth. At about three months the muscles of the neck have developed sufficiently to allow the infant to hold up its head in an uncertain way. At the seventh or eighth month the muscles of the back have become strengthened so that the baby can sit up, and shortly after this it may be allowed to creep. Free play should be given to the muscles of the arms and legs from the first, as muscular and bony development are thereby encouraged. The bones of the legs thus grow and straighten out, but this will be checked if the infant is made to sustain the weight of the body too soon. The average baby should not be encouraged to stand before the twelfth month. Efforts to walk may be started from then on to the fifteenth or sixteenth months. When walking has been established, the legs should be straight.

DENTITION.— The process of dentition begins early in intrauterine life, and the cutting of the temporary or milk-teeth should be completed at the end of infancy. At birth, although nothing but smooth gums are to be seen, the alveolar processes enclose the twenty temporary teeth in embryo. When beginning to come through the gums, they usually appear in groups. Even in healthy infants there is often some variation in the order and time of the eruption of these first teeth, but the earliest to be cut are usually one or both of the middle lower incisors at the sixth or seventh month. The rest are gradually evolved, generally in the following order: upper central incisors, upper lateral incisors, lower lateral incisors, four anterior molars, four canines, and finally the four posterior molars. The following table may serve as a general guide:

Middle lower incisors, sixth to eighth month.
Upper central incisors, eighth to twelfth month.
Upper lateral incisors, tenth to twelfth month.
Lower lateral incisors, twelfth to fifteenth month.
Four anterior molars, fourteenth to sixteenth month.
Four canines, eighteenth to twentieth month.
Four posterior molars, twentieth to thirtieth month.

As in other functions there is more or less variation within the limits of health; such irregularity as the lateral incisors being cut before the central incisors may occasionally be seen. In rare cases infants are born with teeth, but these are poorly developed and lost early. Certain unusual cases of rickets, contrary to the common rule, may show very early dentition, perhaps beginning as early as the third month, but such teeth are poor.

DELAYED DENTITION.—Much delay in teething is an evidence of faulty nutrition or constitutional disease, principally rickets. If an infant has cut no teeth by the end of the first year there will nearly always be marked evidences of rickets present. The latter disease is the commonest cause of delayed dentition. The teeth of rickety children are often poorly developed and prone to decay, even the second dentition may be similarly affected by this disease. Cretinism is another cause of very slow dentition. In general, bottle-fed babies are slower in cutting teeth than those brought up on the breast.

DISTURBANCES OF DENTITION.—Many bodily disturbances formerly attributed to teething are now known to have other causes that have been revealed by more accurate diagnosis and pathology. This is a period of rapid growth and instability, especially of the digestive and nervous systems. Many troubles at this time are due more to faulty care and feeding than to any normal physiological activity and growth. Still a certain number of infants do show disturbances at this time that are apparently due to the eruption of teeth, as careful examination fails to show other cause. There may be evidences of nervous discomfort shown by constant restlessness and fretfulness, disinclintaion to take food, and various grades of indigestion. There is drooling with swollen gums, and the infant keeps putting its hands into its mouth. A light, irregular temperature may also develop that will be aggravated by indigestion if food is forced in too great amount or strength. In a few cases the infant seems much sicker, with high fever and severe nervous symptoms, such as semi-stupor or convulsions. Rickety babies are prone to the latter. Most cases, however, show the disturbances of dentition rather by an aggravation of any existing trouble that otherwise might hardly be noticeable.

The treatment consists in careful regulation of the diet, which will usually take the form of temporarily weakening the food, and in giving a sedative, such as sodium bromid. Incising the gums is not advised. Any diarrhea at this time must receive prompt and careful attention.

CARE OF TEMPORARY TEETH.— The teeth must be cleansed twice daily by gently rubbing up and down with a very soft, wet tooth-brush. The health and preservation of the temporary teeth are necessary to favor a good set of permanent teeth. Any pyogenic germs allowed to lodge in the roots may injure the permanent teeth; milk-teeth must accordingly be filled if carious and preserved as long as possible. They also tend to preserve the alveolar shape.

PERMANENT TEETH.— There are thirty-two in the complete set. The first molars are usually the earliest teeth to appear in the second dentition, at the sixth or seventh year. Then the central and lateral incisors, from the seventh to the ninth year; the bicuspids from the ninth to the tenth year; the canines from the twelfth to the fourteenth year; the second molars from the twelfth to the sixteenth year; and the third molars, or wisdom teeth, from the seventeenth to the twenty-first year, or even later.

The proper development of the permanent teeth may be interfered with by malnutrition or repeated attacks of stomatitis which may cause a poor formation of dentine and enamel. The ends of the incisors and molars may show constrictions and erosions. Carious teeth frequently cause earache, neuralgia, adenitis in the the neck, and poor nutrition from chronic indigestion due to imperfect mastication.

HUTCHINSON'S TEETH.— Congenital syphilis will sometimes induce a change in the upper central incisors of the permanent teeth only, known by the name of their discoverer. They are small and peg-shaped, with scooped-out grinding edges, usually deflected inward; occasionally they are deflected outward.

Growth during Childhood.

The increase in weight and height depends upon race and climate as well as on the size and physique of the parents. It is thus evident that no absolute rules can be given for comparison that will apply to all children. We have already given data as regards infancy, when growth is steady and rapid. After the period of infancy, growth is not relatively so rapid and takes place more in cycles. It depends very largely upon good heredity, and a healthy well-nourished state during the first years of life. Biological researches have shown that favorable embryonic conditions and good nutrition during the earliest years have the greatest influence in determining the full height and development of the individual. If a child is fortunate in its birth and well nourished up to its fifth or sixth year, there will probably be a normal growth thereafter, as, even if there are poor conditions later on, nature will probably be able to compensate for them. Each individual has a certain normal size to attain which will usually be reached if the first years have been favorable. It is difficult to make up, however, for early unfavorable conditions.

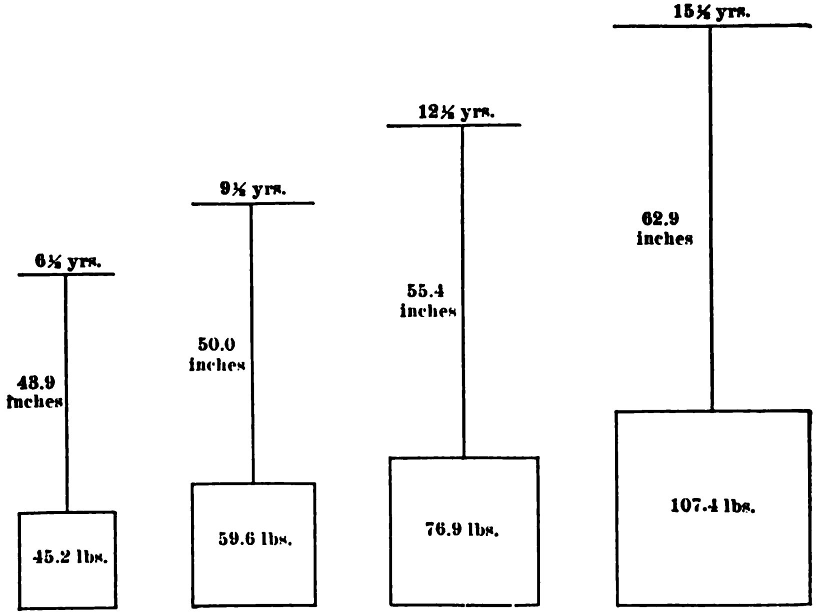


FIG. 13.—Diagrammatic table of relative measurements.

The two principal periods of acceleration of growth occur during the second dentition and at the period of adolescence. This roughly corresponds, first, with the period from six to nine years in boys and girls, and second, from eleven to thirteen in girls and from fourteen to sixteen in boys. This cycle of increase in height should precede and be shortly followed by an increase in weight. There also tends to be some variation in growth at different seasons. In a series of cases quoted by Tanner, the period of most rapid increase in height among seventy boys, from seven to fifteen years of age, was found to be from April to August, and the least from August to December, while the greatest increase in weight occurred from August to December, and the least from April to August.

Whenever there is a rapid increase in height, the child is apt to grow thin and anemic, as the making of bone particularly uses up the red blood-corpuscles. The children then become nervous and irritable, requiring extra care at home and school.

In order to present a guide of average growth, the following tables have been combined and compiled from the studies of Boas on the rate of growth in height and of Burke on the weight of American children:

Table of height and weight of American boys.

Years	Average height (Boas)	Average weight (Burke)
6½	43.9 inches	45.2 pounds
7½	46.0 inches	49.5 pounds
8½	48.8 inches	54.5 pounds
9½	50.0 inches	59.6 pounds
12½	55.4 inches	76.9 pounds
15½	62.9 inches	107.4 pounds

Table of height and weight of American girls.

Years	Average height (Boas)	Average weight (Burke)
6½	43.3 inches	43.4 pounds
7½	45.7 inches	47.7 pounds
8½	47.7 inches	52.5 pounds
9½	49.7 inches	57.4 pounds
12½	56.1 inches	78.7 pounds
15½	61.6 inches	106.7 pounds

MENTAL AND MORAL GROWTH.— The mental development of the child must be carefully watched from the beginning. Just as the human embryonal life represents various upward stages of animal development, so the child's mind reproduces in miniature the earlier stages of the growth of the race. It is early necessary to recognize the various tendencies that manifest themselves in a growing child, so that they may be guided aright. It must be remembered that the child exhibits the elemental human forces and instincts. Just as the emotions are developed in the race before the reason, so it is with children, who can be moved by their sympathies long before they can be influenced by their intellect. Love is a surer guide for them than reason. This is the secret of success of many mothers and of some teachers. The most lasting impressions of childhood come through the feelings.

At the end of infancy, and during early childhood, the imitative faculties are especially dominant. The acts of older children, of adults, and even of animals are faithfully copied without much idea of their significance. Up to the age of seven years much of the training and education of the child must come from imitation. Before this age nearly all the playing of children is imitative, shown by the delight in toys representing articles in real life, but after this, especially in boys, the games take on a more competitive form involving muscular exercise.

There exists in some children a touch of barbarism that is merely an evidence of underdevelopment. Apparent cruelty, shown in a callousness to suffering, is sometimes seen, but this is rather due to a lack of experience as to the meaning of pain than to defective moral sensibilities. The conduct of the child is largely influenced by the tone and temper of those around him, in the intellectual as well as in the moral sphere. A cultivated home will do more for the proper development of the child than the formal education of the finest schools.

ADOLESCENCE.—The beginning of this period is a most interesting and critical time for the child. Up to this time, as already noted, the child has lived the race life, but he now begins to develop individual characteristics, and family traits come out more strongly. There is a rapid growth of all parts of the body, especially marked in the reproductive organs and the heart and lungs, with increase in blood-pressure and in general glandular activity. The appearance of hair on the pubes is considered characteristic of the period. The peculiarities of sex now begin to manifest themselves; boys and girls cease to mingle in such an indiscriminate way as in earlier childhood. Up to twelve years there need not be much differentiation of the sexes, but after this they must be separately considered. Vague aspirations and a general restlessness show the stirring of new life in the child's mind. Both the emotional nature and the imagination become very active. If any trait is entirely absent at this time it is not apt to be seen later in life.

As growth and development are so rapid during adolescence, nothing must be allowed to conflict with the physical nature at this time. Overstrain in school must be guarded against. It has been proven from examinations of many school children that, as a rule, the heaviest and tallest, or those with the best physique, stand highest in their classes. Hence if a child is poorly nourished or undeveloped, the best thing, even for his intellectual growth, is to focus attention on his body for a time and let his mind be temporarily neglected. Apparent stupidity or bad mentality in school children is often the result of physical causes that may and should be removed. Deafness, defective eyesight, enlarged tonsils and adenoids, and poor nutrition from lack of proper food may be especially mentioned in this connection.

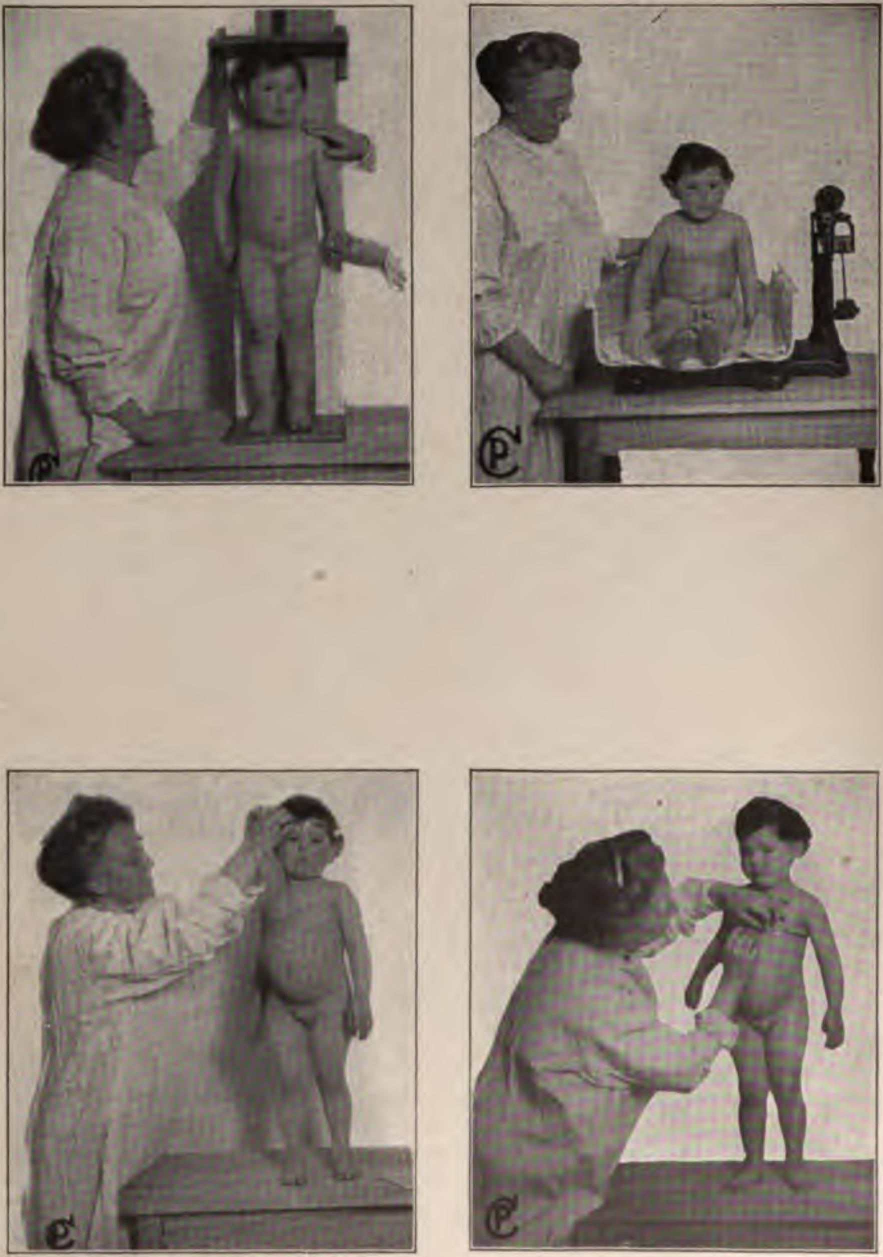


FIG. 14.— Correct method of measuring, and weighing a child.

SECTION III.

THE EXAMINATION OF THE SICK CHILD.

CHAPTER VI.

THE EXAMINATION OF THE SICK CHILD.

If the physician unaccustomed to the care of children will first learn what to expect to find in the normal child, he will better appreciate the variations in disease. He must first of all learn that a proper examination will take time, and that a hurried examination often leads to grievous errors. Having once made up his mind to be systematic, thorough, and painstaking, the bugbear of pediatric practice will begin to disappear, and diagnoses will be made where formerly there was disappointment and confusion. The younger the infant or child, the greater are the peculiarities from the adult type in its relation to disease.

History.— If possible obtain the anamnesis outside of the nursery. It should preferably be obtained from the mother or attendant who has been in closest attendance upon the child. First — elicit a natural story as to the change from the healthy child to the sick one. If digressions are made they can be guided back to the proper channels. This will give a clue to the nature of the illness, and the further questions will be modified considerably thereby. For example, if the disease be one of malnutrition, most careful details of previous feeding from the time of birth will be pertinent, and the dietary life traced to the present time. Heredity and environment are inquired into, and previous illnesses recorded on properly prepared history blanks. The accompanying history card, as suggested by Dr. R. S. Haynes, is one that is convenient to carry, and tends to making recording systematic and of value without much waste of time and energy in writing.

Inspection.— *The child asleep.* Trained observation is the most valued asset of the pediatrist. If possible, examine the child while it is asleep. Sit by its crib and watch it. Its general posture, if quiet or restless is to be noted. The breathing as to its character must likewise be observed, and the number of respirations per minute counted.

RESPIRATIONS.

Newborn,	35 to 45	First to second year,	20 to 25
First to the second month,	24 to 36	Second to sixth year,	20 to 23
Second to the sixth month,	20 to 32	Sixth to twelfth year,	18 to 20

HISTORY BLANK.

Date Name Address
Diagnosis Child of Mr.
Family History Children living Ch. dead Cause Age
Rheumatism Tuberculosis Syphilis Environment
Nervous Dis. Alcohol, etc. Miscarriages Parentage
Personal History child, born at Labor Wt. at B. lb.
Sat up at mo. Talked at mo. Teeth at mo. Walked at mo.
General Health and Habits
Appetite Eats between meals? Abnormal articles
Bowels Bath Fresh Air
Sleeps Amount Snores? Mouth Br?
Previous Diseases Meas. Wh. Cg. C-Pox Scarlet. Diphth. Mumps. Sm-Pox
Gastroenteric
Respiratory
Ear Throat Colds
Diet from Birth Nursed Mos.
Present History

EXAMINATION.

Weight lb. Height in. Circ. Head in. Circ. Chest in.
General Condition Color Muscles Reflexes
Mentality Sits? Walks? Talks?
Head Fontanel Sutures Craniotabes
Eyes Nose Disch. Breathing
Mouth Tongue Muc. Memb. Teeth Ear
Throat Tonsils Adenoids
Lymph Nodes Epitrochlears
Thorax Shape Rosary Groove
Heart
Lungs
Abdomen Umbilicus Liver Spleen
Genitals Skin
Extremities Epiphyses Contour Feet Spine
T. P. .R. Blood R.B.C. .Hb. %. W.B.C.
Urine React. S. G. Alb. S. Ind. Mic. Exam.
Special Exam's. Special Tests

The respirations may be counted by the hand on the abdomen or by observation alone.

If the neck and chest can be exposed without waking the child, additional information is gained by observing the effect of the respirations on the supraclavicular and suprasternal spaces.

Mouth breathing is easily detected in sleep, and the half-closed eyelids are indications of the weakened state. The pulse may be obtained without awakening the child with a little care, and is a more reliable guide than when influenced by fright.

If there is a gastrointestinal disturbance inspect the last soiled napkin.

The Child Awake.— Enter the room without apparently taking much notice of the patient; a cheery word of greeting and an interest in his favorite toy will often be sufficient to disarm suspicion and win a friend. Now have the patient entirely undressed.

In the case of an infant it is best examined on a table in a good white light; if a child allow it to sit up. (If you wish a child to cry at once make it lie down.) If the infant is crying, much valuable information is obtained if this is properly interpreted. (See section on signs of illness, p. 60.)

First begin your inspection as to general development, musculature, emaciation, and the condition of the skin, as these factors will influence or modify local changes seen elsewhere. Beginning at the head, note any abnormalities in detail, *i. e.,* as to its size, shape, hair, eyes, eyelids, pupils, nose, mouth, gums, teeth, etc.

The significance of abnormal conditions as seen here are given in the suggestive diagnostic key, which see (p. 85). Note the contour of the neck, the presence of enlarged lymph-glands, the spaces above the clavicles, the chest itself, if well formed, or if showing any bony changes; whether there is a visible apex beat or a thrill over the precordium; the movements of the upper extremity, if natural, or if there is any paralysis; the finger-tips may give valuable information as to circulatory or pulmonary involvement; the abdomen if distended or sunken; the external genitals for abnormal formation or discharge. The lower extremities are compared to the upper for development, bony changes and mobility. The infant may now be turned over and the back of the head, spine, and rectum examined.

The temperature should always be taken in the rectum. The best plan with an infant is to have it lying face down across the lap of the nurse. An older child is least annoyed by the procedure if the thermometer is inserted while the patient is lying on the side. It should be pushed past the sphincter and remain in the rectum for three minutes. The range in the normal infant varies from 98.8° to 100.2° F. Premature infants quite constantly have a slightly subnormal temperature. Daily variation of several tenths of a degree are noted. The average temperature in early infancy is 99° F.

Palpation.—This is more readily and satisfactorily accomplished if both hands are used.

Beginning at the head, the right hand palpates the right side of the body and the left hand simultaneously palpates the left side. The contour of the head and the fontanels are thus easily ascertained. Craniotabes, if present, will not escape attention. Any glands in the occipital region are palpated and noted if enlarged. The lower eyelids are pulled down by the fingers and the mucous membrane examined. Slight pressure on the chin will afford an inspection of the lips, teeth, and tongue; the examination of the throat being left for the final procedure (p. 328). The hands are now passed over the neck to find any abnormalities in the anterior group of glands. Next the shoulder-joints and the axillæ are explored; at the same time the musculature will be estimated to aid in establishing the degree of physical development. The epitrochlear glands should not be forgotten in the examination. The hands of the patient are palpated for temperature, irregularities, or clubbing. The pulse is best counted when the child is asleep. The carotid or temporal pulse may be used if the wrist is not exposed.

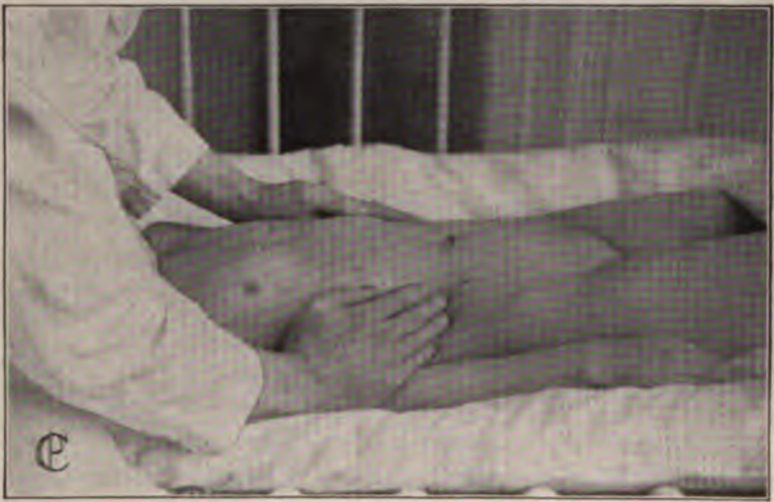


FIG. 15.—Method of palpating liver and spleen.

In extremely weak infants the count is taken of the heart beats at the apex by using a stethoscope.

The pulse varies from:

and averages
120 to 140–in the new-born.
110 in the first year.
100 in the second year.
90 in the fifth to the eighth year.

If the child is irritated, crying, or in pain, the pulse rate will be accelerated, and a note should be made of this circumstance. The force and character of the pulse are of as much importance as its frequency.

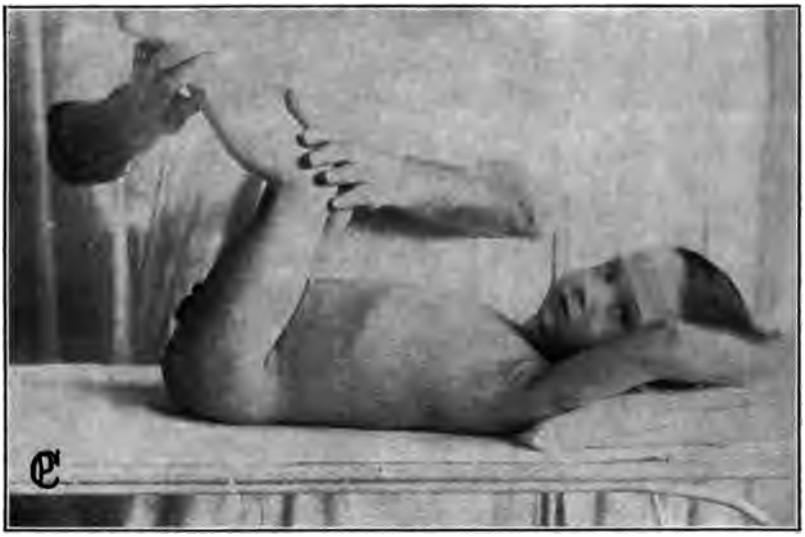


FIG. 16.— Method of eliciting Kernig's sign.

The apex beat on the chest wall may be located, or a thrill felt in certain valvular diseases, and occasionally tactile fremitus will be an aid in diagnosis. Bony rachitic changes as the rickety rosary or Harrison's groove are identified by the examination with the hands.

The right hand on the abdomen feels for the lower border of the liver, while the left may palpate the spleen. If this is palpable in a child, it is said to be enlarged. The liver in infants when in the prone position is normally about one inch below the free border of the ribs. In the erect position in the infant it may touch the crest of the ilium. Tumors in the abdomen and an enlarged kidney as in pyelonephrosis can be palpated.

The hip-joints and the knee-joints are examined for mobility. Pain, if elicited over the tibia, may assist in establishing the diagnosis of scurvy. The ankle and feet are examined for signs of edema and flat-foot. The lower extremities are approximated, and any abnormalities in outline such as knock-knee or bow-legs will then be readily appreciated.

The child is now induced to walk, and if postural defects warrant it a detailed examination of the spine for scoliosis or Pott's disease is made.

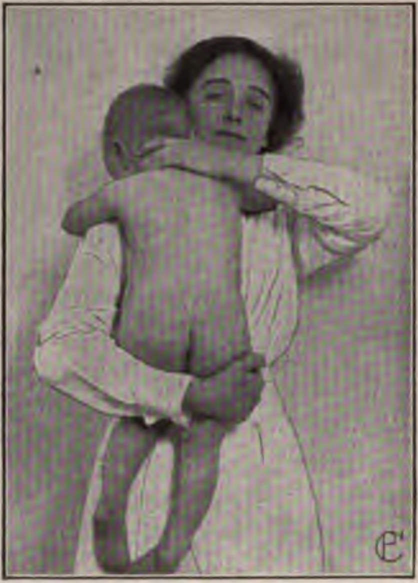


FIG. 17.— Correct position of holding an infant for auscultation.

The patellar reflex may be tested by raising the thigh from the table and allowing the leg to hang limply. A smart tap over the tendon below the patella should elicit a ready response. In older children it may be necessary to distract their attention by asking them to look at the ceiling or pull their interlocked fingers apart while the test is being made.

Kernig sign is said to be present when we cannot easily extend the leg after it has been flexed on the thigh. The test is best made with the child in the prone position, using one or both lower extremities. The thigh is flexed on the abdomen and the leg on the thigh. When we now attempt to lift this leg upward and forward, a distinct sense of resistance is felt. Except in children with spasticity due to cerebral conditions, this sign is a valuable one, indicative of meningeal irritation or cerebral involvment.

The Babinski reflex or the hyperextension of the great toe and a flexion of the remaining toes, is elicited when the plantar surface of the foot is irritated by drawing the finger-nail across it. This sign is of value only after the second year of life, since it may ordinarily be elicited in perfectly normal infants.

The Brudzinski sign, when obtained, is another evidence of marked meningeal irritation. It is elicited by forcibly depressing the chin to the chest, the chest being held to the table by the examiner's hand. When the sign is positive, the previously relaxed extremities are quite suddenly drawn up so that the child assumes a crouching attitude.

The contra-lateral sign is quite generally obtained in meningeal cases and is evidenced by simultaneous flexion of the opposite extremity, when flexion of one extremity is made by the examiner.

Auscultation.— This should preferably follow palpation or sometimes, if expedient, the inspection. Infants should be held in the arms of the mother or nurse, against her left shoulder with the infant's back to the examiner, as illustrated in Fig. 17.

A stethoscope with a small bell is quite necessary, as the ear cannot advantageously be placed, for example, in the axilla of an infant. Children are best examined seated upon a table. The stethoscope is alternately passed from side to side in a line parallel to the spine, then the infrascapular region is auscultated, then in the axillary line on either side, beginning well up in the axilla, with the arms raised above the head.

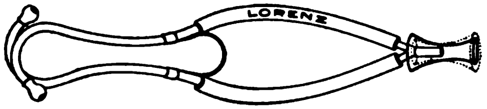


FIG. 18.— Pisek's reversible stethoscope.

The front of the chest is gone over in a similar manner. The examiner should recollect that the lungs in an infant on the left side posteriorly reach to the eleventh rib; on the right side posteriorly, to the lower border of the ninth rib. In front, on the right side to the fourth or fifth rib and on the left side to the ninth or tenth rib.

Auscultation of the heart sounds is made at the apex, at the base, and at the second right intercostal space; if any murmurs are present they are traced along the lines of intensity.

The examiner must accustom himself to pick out the normal breath sounds while the child is crying. After he becomes expert he will almost prefer that the child cries while he is auscultating. So-called puerile breathing, that is, exaggerated normal vesicular breathing, is to be expected.

It must further be recollected that the chest wall is thin, and the sounds within are therefore more readily transmitted to the ear.

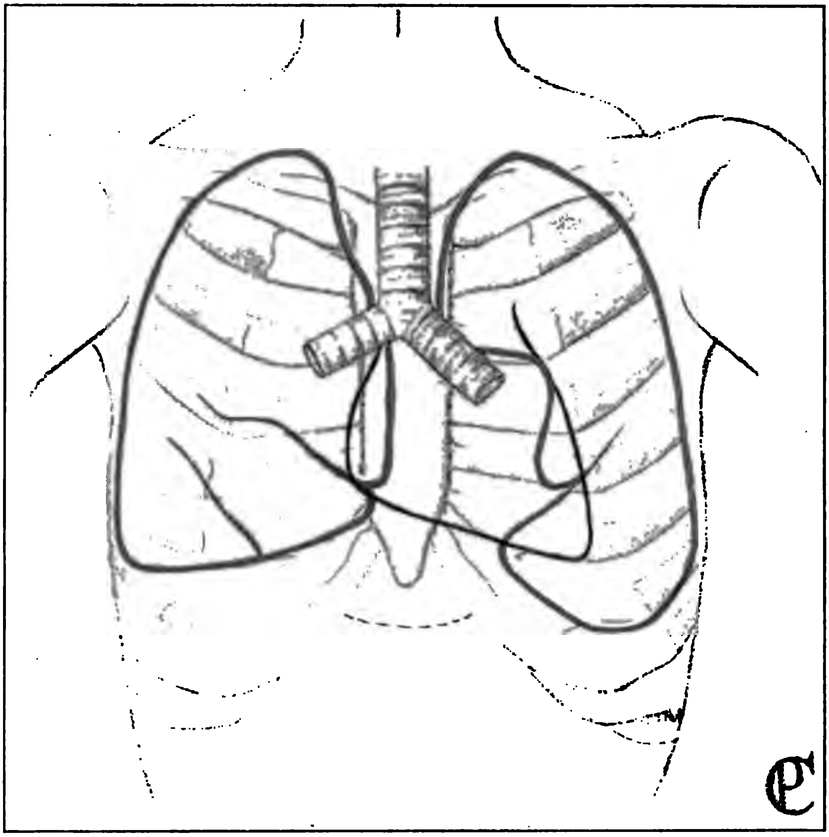
Percussion.— This should be accomplished with a sudden light tap because of the thin wall and the elasticity of the ribs. Percuss alternately from side to side, preferably first over the dorsum of the chest, then the anterior surface of the lungs, and finally the area of the heart may be mapped out.

To do this begin your percussion near the clavicle and percuss downward until the note changes at the base of the heart. Make your line here with a flesh pencil. The right border of the heart is found by beginning the percussion well to the right of the sternum and mapping out this border to the apex. The left side is similarly found, by beginning the percussion from the axillary side. The apex beat may be located both by palpation and auscultation.

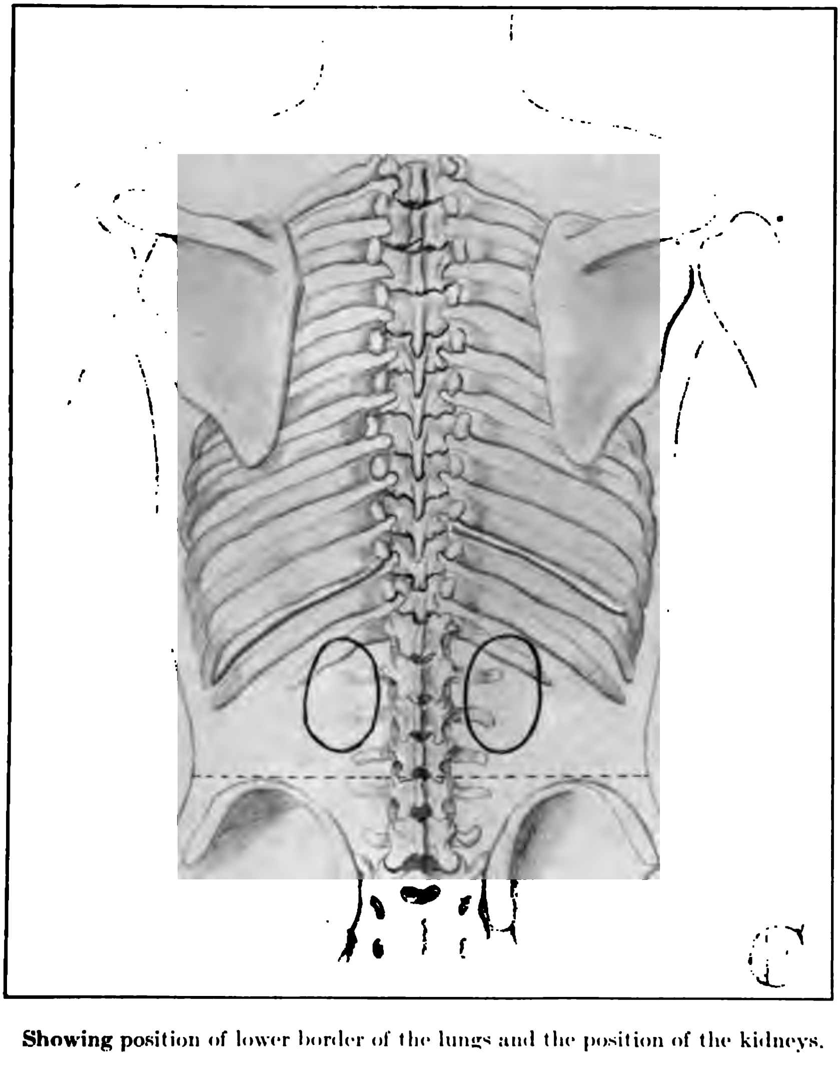
The area of absolute heart dullness is relatively small in infants, but the fact that the lungs do not overlap the heart as they do in the adult should not be forgotten in percussing for the relative dullness. Percussion over the abdomen may be made, to obtain the lower border of the stomach, or a distended colon, for free fluid in the abdomen, a distended urinary bladder, partial intestinal collapse, or appendicial abscess. In cerebral cases in which fluid is suspected in the ventricles Macewen's sign should be sought for; this consists of a tympanitic note heard over the parietal area when the ventricles are distended as in hydrocephalus or in certain cases of meningitis.

Mensuration.— The weight should be recorded in infants once or twice a week, in older children, each time they are brought to the physician so that he may judge of the progress of their general development. For infants a weight chart, such as has been devised by Dr. W. L. Carr, is useful. The standing height should be occasionally taken and compared to the weight. (See diagrammatic table, page 28, for normal relations.) The circumference of the head and chest and their relations to each other give valuable data as to disease conditions or to defects in physical development. The tape used should be made of nonstretchable linen or steel. If on auscultation or percussion signs of fluid in the chest have been obtained, the tape measure may show the affected side of the chest to be greater than the other. Mensuration of an atropic extremity or muscle groups are made in cases of infantile paralysis or in the dystrophies.

PLATE I.



Illustrating topographical anatomy of the lungs and the lobes, also position of the heart and relations of the bronchi.



Showing position of lower border of the lungs and the position of the kidneys.

Rectal Examination.—The rectum and sacrum in infants and children is almost straight, and because of the shallow pelvis, the so-called "pelvic organs" of the adult are found to be partly or wholly abdominal in the infant and child.

The index-finger in the case of the child, or the little finger in the infant, can be used, and with the help of the other hand, bimanual examination is easily made. The abdominal wall is usually thin and offers little or no resistance to the palpating finger. As a rule, no anesthetic is required, as the sphincter relaxes easily and the discomfort is temporary. The child should lie on its back with hips elevated and the thighs flexed on the abdomen. The examiner standing on the right side of the patient explores with the well-lubricated finger of the right hand, using the left hand for abdominal palpation. The operation is reversed for the left side of the body. Any abnormalities, new-growths, or diseased conditions of the structures and viscera in the lower abdomen can then be palpated and much information gained.

In cases of tuberculous peritonitis the abnormal omental thickening and the matting of the intestines can often well be made out, the diagnosis thus confirmed, and the prognosis made more definite. Enlarged mesenteric and retroperitoneal glands are palpable by a sweeping motion of the introduced finger without the necessity of changing hands.

Intraabdominal sarcomata can be quite definitely located; calculi in the bladder or ureters palpated, malformations of the kidneys or enlarged kidneys, as in hydro-, or pyonephrosis may be distinguished.

Therefore, in an abdominal case where the diagnosis is not absolutely clear and uncomplicated, the examiner should not pass judgment upon a given case without recourse to a thorough examination through the rectum.

CHAPTER VII.

SPECIAL EXAMINATIONS.

Exudates.— A culture and a smear should be made for examination if the throat, *e. g.*, shows a suspicious membrane or if there is a serosanguinolent discharge from the nares. A sterile cotton applicator is swabbed over the area and gently wiped over the culture medium and upon a clean glass slide.

The laboratory examination of these exudates is most important in differentiating diphtheria from other infections of the nose and throat. In making a positive morphological diagnosis of the diphtheria bacillus (Klebs-Loeffler) certain very definite conditions must be complied with. The smear must be taken from the nasopharnyx or laryngeal region. It must be grown upon a special media (blood serum), and it is best that it should not be grown for much more than sixteen hours at incubator temperature. Under these conditions the bacilli (if they are the Klebs-Loeffler) must show a certain morphology. Their characteristics are a long slender bacillus with clubbed ends, which stain very irregularly and often show deeply staining polar granules.

It is not uncommon for the first, and even for the second smear to be negative in a case which afterwards becomes positive. This fact is explained in two ways. Many sore throats start out as a mixed infection, staphylococci or streptococci predominating in the early stages. Under these conditions it is sometimes difficult to determine how much weight to give to a few bacilli which look diphtheritic when the vast majority of the organisms present are cocci. A safe rule in such circumstances is to regard it as doubtful and to give an injection of diphtheria antitoxin. A second cause for a negative smear is in diphtheria of the nasopharynx or larynx which is overlooked, the smear being taken from some place in the throat which happens to be clear of infection or which has been treated with disinfectants.

A purulent secretion from the eyes may demonstrate on smear the presence of the Koch-Weeks bacillus or the gonococcus of Neisser. A similar test of a vaginal or urethral discharge may be necessary to determine the character of the contagion and to determine upon the necessary precautionary measures.

The Sputum.— The examination of the sputum in infants and very young children is not satisfactory, owing to the difficulty of obtaining a satisfactory specimen. This may in a measure be overcome by passing a stomach tube into the first part of the esophagus — the tube as a rule bringing up some secretion. A more agreeable method is to pass a cotton swab on a long sharply bent probe into the larynx. In order to do this the epiglottis must be held forward as is done in passing a laryngeal tube. Smears made from sputum obtained in this way will *occasionally* show tubercle bacilli. In lobar pneumonia it is sometimes possible to demonstrate rusty sputum in this way. The pneumococcus and influenza bacilli can be found in such a smear.

Gangrene of the lungs is characterized by the offensive odor and by the color and fluidity of the sputum. Such sputum will separate into layers, with a thick brownish deposit at the bottom, a clear fluid in the middle, and a frothy layer on the top.

When an empyema ruptures into the lungs the sputum is composed almost entirely of pus, and is thin and liquid.

In those cases where bronchiectatic cavities have formed, the sputum is abundant and thin, and on standing separates into a layer of pus and one of mucus. If the cavities are large, putrefaction can take place, and large amounts of thin, foul-smelling gray-green fluid may be coughed up.

The Gastric Contents.— The examination of the gastric juices in infants and small children has not developed any special diagnostic features of importance.

Much can be learned in this way as regards gastric motility, but aside from this such examinations have an astonishingly small value.

The Feces.— It is certain that the feces are not examined as frequently as they ought to be. Much can be learned regarding the well-being of the infant and the small child by a systematic inspection of the stools. As a rule the whole stool is not necessary, one or two drams being a sufficient amount. The examination should be made as promptly after the passage as is possible, as the stool undergoes putrefactive and fermentative changes if allowed to stand. In examining for ova an old stool may be used.

The reaction of the stool of course changes rapidly on standing. In a general way it may be said that a strongly alkaline reaction in feces which have recently been passed, suggests protein putrefaction, and that an acid reaction points towards a disturbance in the digestion of the fats.

An excess of muscle fiber, connective tissue or vegetable fiber can be determined by placing a small piece of the stool under the microscope. If Lugol's solution is added, the starch granules are stained blue or violet. There should be practically no unchanged starch in the normal stool. An alcoholic solution of Sudan III or scharlack R stains fat globules red, and the fatty acids a somewhat lighter color. The casein is soluble in a 5 per cent. solution of HCl or in a little acetic acid, and is hardened by the addition of formalin. Coagula composed of casein, or of mucus plus fat, fatty acids and insoluble soaps are sometimes found in the stools of infants. Most of these coagula are of the latter type, though occasionally true casein curds are present in the stools. The point can, as a rule, be quickly determined by shaking out a few of the masses in ether — those due to fatty acids, soaps, etc., are dissolved by the fats going into the solution with the ether.

Blood in the feces can be identified by adding 10 drops of freshly prepared alcoholic solution of resin guaiac and 30 drops of ozoned (old) turpentine to an ethereal extract of the stool. Another method is to dissolve a few granules of benzidine in 2 c.c. of glacial acetic acid. A small fragment of the stool is mixed with 2 c.c. of water and boiled. Ten drops of benzidine-acetic acid solution and 3 c.c. of a 3 per cent. hydrogen peroxide solution are mixed in a test-tube and a few drops of the cooked emulsion of feces are added.

In both these tests a greenish or bluish color shows the presence of blood. The benzidin test is extremely delicate, and may be positive if the patient is eating meat.

Ova.— Any of the cestoda may exist in the intestinal tract of children. Their identification depends upon finding the ova in the stool — as a rule not a difficult matter with the more common forms, though during the earlier stages of the infection a long and careful search must be made.

The Cerebrospinal Fluid.— The examination of the spinal fluid has great diagnostic value. The normal fluid should be collected with absolute surgical cleanliness so that if necessary cultures on blood serum can be made; and care should be taken not to get a " bloody " puncture, for even the smallest quantity of blood obscures the macroscopic appearance of the fluid, and also makes a cytological examination impossible.

In meningitis there is always an exudate of cells, which makes the fluid more or less cloudy. In tuberculous meningitis the cellular exudate is sometimes so slight that the fluid appears clear unless carefully examined.

The normal fluid contains less than 12 cells to the c.cm. and any number over 20 should be considered pathological. To make this determination the fluid should be examined before any coagulation takes place.

A preponderance of polynuclear leukocytes in the exudate denotes a non-tuberculous meningitis, except in the early stages of the disease when they may be present in large numbers. On the other hand, when a majority of the cells are either large or small lymphocytes, tubercle bacilli should be looked for. Syphilitic fluids as a rule show a relatively large percentage of lymphocytes.

In epidemic spinal meningitis it is always possible to find the diplococcus intracellularis. In the earlier stages of the disease they are more easily found than later; and a few days after the injection of Flexner's serum it may be almost impossible to find them. They are gram-negative, and intracellular. Occasionally an acute meningitis is caused by the pneumococcus, influenza bacillis and still more rarely by other organisms, such as typhoid bacilli. The diagnosis of these latter conditions depends upon cultures and the agglutination tests.

To find the tubercle bacilli in the spinal fluid often requires hours of patient search. If the fluid is allowed to stand for a short time there appears at the center a thin film of fibrin. This should be removed and dried on a cover slip. The fluid itself should be centrifuged for one-half to one hour at 2,500 revolutions per minute, and the sediment dried on the same cover slip as is the fibrin. After staining it is possible to demonstrate in nearly 100 per cent. of the cases the Bacillus tuberculosus. The diagnosis can also be made by inoculating a little of the sediment into a guinea-pig.

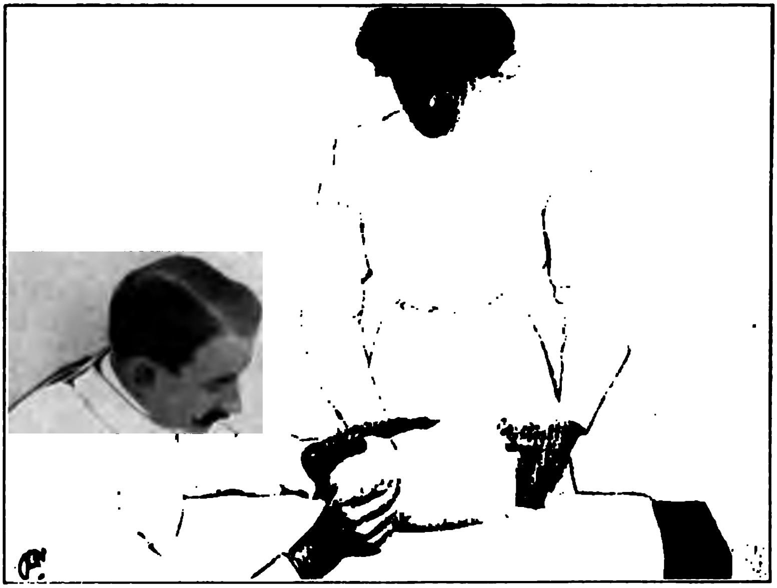


FIG. 19. Method of performing subdural or lumbar puncture.

A Wasserman reaction may also be made with spinal fluid, and it is apparently as dependable as when blood serum is used. (See also page 58.)

Noguchi has devised a method which may prove applicable to some of the ill defined inflammatory conditions of the meninges, such as the so-called serous meningitis in which micro-organisms and inflammatory cells cannot as a rule be demonstrated. The method is as follows:

To one or two parts of cerebrospinal fluid are added five parts of a 10 per cent. butyric acid solution in a physiologic salt solution. This is boiled for a brief period. One part of a normal solution of NaOH is then quickly added, and the whole boiled once more for a few seconds.

The increased amount of protein in the cerebrospinal fluid is indicated by the appearance of a granular or flocculent precipitate. Normal cerebrospinal fluid gives a slight opalescence or sometimes a turbidity, but not a granular precipitate, unless allowed to stand for a number of hours. This test is positive in syphilitic and parasyphilitic conditions, and in all cases of inflammations of the meninges caused by micro-organisms. It suffices to distinguish normal from pathological cerebrospinal fluid, and especially that form of pathological fluid which is altered through an increase in its protein content.

Cerebrospinal fluid often contains a sugar reducing agent, but this condition is only of confirmatory diagnostic value so far as is known at the present time.

Technic for Subdural or Lumbar Puncture.— One of two positions may be selected: the sitting posture, or the child may be placed on its side with the spinal column well flexed. Cleanse the lower lumbar area until the parts are surgically clean. The operator, who has thoroughly cleansed his hands then takes the sterilized needle in his right hand, as one holds a pencil in writing, and inserts the same at right angles to the body through the skin and soft parts between the third and fourth lumbar vertebræ (see Plate II). This point is conveniently located by placing the index- and third fingers of the left hand on the highest points of the respective iliac crests, the middle finger being placed on the vertebral spine which is on the same level as the crests above determined. This is the third lumbar spine, and the point of election is midway between this spine and the one immediately below it. The needle meets with only cartilaginous resistance if properly inserted, and should be introduced about three-quarters of an inch. If bony resistance is encountered, withdraw slightly (not entirely) and change somewhat the angle of insertion. If the spinal canal is entered a free flow of fluid follows; then allow the fluid to escape into a sterile tube. At the same time collect two or three drops in a culture tube of blood serum. When 15 c.c. have been collected quickly withdraw the needle and seal the puncture wound with cotton and collodion.

Technic for Aspiration of Pleural Cavity.

Aspirated fluid from the chest when slightly clouded is microscopically examined for the presence of pus-cells, and operative interference is often based on their numerical estimate.

Sterilize a needle and clean the chest wall over the site of election, in all cases observing strict surgical asepsis.

Place the child in a sitting posture with both arms drawn well forward then, holding the needle at a right angle to the body, puncture in the midscapular or in the posterior axillary line (preferably the former), the point of election being the interspace just below the angle of the scapula. Insert the needle about three-quarters of an inch. From the fluid a culture is made and the remainder is collected in an empty sterile tube for further examination. Seal the puncture wound with cotton and collodion.

The Urine.

Only the more important diagnostic features of urinary analysis will be touched upon. The subject has a great practical interest not only for the diagnosis of kidney lesions, but also for the recognition of changes in other organs.

The specimen should as far as possible be a part of the whole 24-hour urine, in order to avoid the well-known variations in the specific gravity, the reaction and other properties of the urine. For microscopical examination it is important to have a fresh specimen as decomposition may change the entire picture within a few hours. Fermentation sometimes results in the entire disappearance of small amounts of sugar and greatly reduces the total percentage where it is present in larger quantities. All such changes may at least be delayed by keeping the urine in the ice-box or by the addition of small amounts of salicylic acid, thymol, chloroform or chloral.

Quantity.— Infants pass a relatively larger amount of urine than do older children and adults. Furthermore, the quantity fluctuates widely from day to day, according to the amount of fluid food taken and the activity of the bowels and the skin. The average amount passed during the first week of life is from three to twelve ounces a day, and during the first two months from five to thirteen ounces. From this time up to the end of the second year the quantity of urine passed gradually increases, so that the average is from eight to twenty ounces. Between thirty and fifty ounces of urine are passed daily from the eighth to the fourteenth year.

During the first two years the urine is passed as often as twice in the hour when the child is awake, but during sleep is retained from two to six hours. A fair control of the sphincters of the bladder is often obtained at two years, and sometimes at an even earlier period.

The specific gravity during the first eight years of life averages 1008-1012. Microscopically the urine normally contains epithelial cells, mucous, granular matter, crystals or uric acid, amorphous and crystalline urates and the amorphous and crystalline inorganic salts. When prolonged and very careful examinations are made, hyaline and even an occasional hyalo-granular cast may be found in the urine of healthy infants.

Sugar in minute quantity is not infrequently present during the first two months; and traces of albumin have been observed in a fairly large number of cases.

Test for Indican.

The simplest and probably the most accurate test for indican in urine is performed as follows: to a clean test-tube add four to six drops of a 1 per cent. solution of potassium permanganate, then 1 or 2 c.c. of chloroform, then 10 c.c. of concentrated hydrochloric acid C. P., and lastly 10 c.c. of urine. Invert the test-tube two or three times to thoroughly mix and allow to stand five minutes. The ethereal sulphates in the urine are broken down by the hydrochloric acid and are oxidized by the potassium permanganate to indigo which is dissolved by the chloroform, giving a deep blue color, the intensity of which when compared with the color scale (Plate III) determines the extent of the putrefactive changes occurring in the intestine.

The presence or absence of indican in the urine is important, as its presence indicates an excessive putrefaction of the protein substances in the intestines. The test can also be made by placing an equal amount of urine and hydrochloric acid in a test-tube to which is added *one drop* of peroxide of hydrogen. If much indican is present a dark blue or purple color is produced, which may be shaken out with chloroform. The reaction may not appear at first but may come out after standing for a time. If more than one drop of hydrogen-peroxide is added the blue color may be bleached. In alkaline urine the indican is usually destroyed.

Transudates and Exudates.

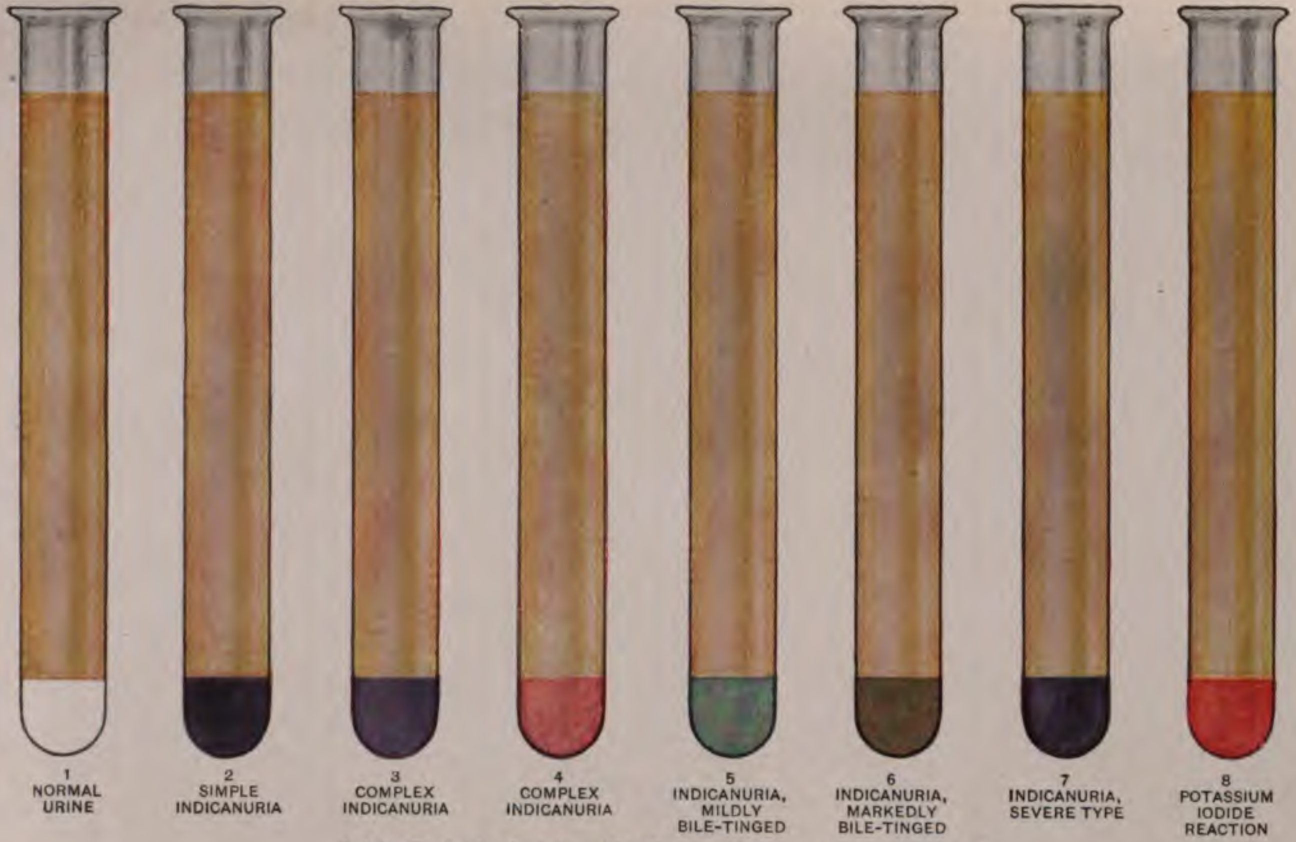
Rivalta has recently perfected a test for accurately distinguishing between transudates and exudates.

Add 2 drops of acid acetic (glacial) to 100 c.c. of water to make the test solution. Allow the exudate, a drop at a time, to make its way down through the dilute acid medium and it will leave a bluish trail in the water like a puff of cigarette smoke, each drop leaving a separate trail. The fluid remains clear and unaltered if the added drop be that of a transudate.

The Roentgen Rays.

The Roentgen rays are, of late, assuming a more important role in pediatric practice. Foreign bodies swallowed or aspirated, fractures and dislocations, bone changes and tumors, displaced viscera, consolidations and exudations in the thorax are conditions in which we can obtain valuable aid. In the stomach and intestinal tract the use of bismuth enables us to obtain exposures which show clearly the patency or non-patency of the pylorus, congenital conditions such as megalacolon or transpositions of portions of the tract. Short exposures should be made with the best tubes and sensitizing sheets. An anesthetic is sometimes necessary for unruly children.

PLATE III.



INDICAN COLOR SCALE

COURTESY OF W. H. PORTER, M.D., NEW YORK.

Lesions in Children in Which the X-Ray May Be Used as an Aid in Diagnosis.

Foreign bodies (metallic).
Fractures or dislocations.
Bone diseases.
Joint diseases.
Renal, ureteral or vesical calculus.
Kidney — (displaced, dilated or deformed) (injected with collargol or air).
Lungs: Incipient tuberculosis or any other lesion of the parenchyma.
Thorax: Mediastinal glands. Pleurisy with effusion or empyema.
Head: Infection of accessory sinuses. Lesions of the inner table of the skull.
Teeth: Malposition or unerupted teeth.
Oesophagus: Stricture dilatation, diverticulum.
Stomach: Size, shape and position; stenosis or spasm; negative diagnosis of carcinoma of pylorus.
Colon: Size, shape and position; adhesions, kinks, new growth, motor insufficiency.
Small intestine: Identification of duodenum, jejunum, ileum and motor insufficiency.
Intussusception.
Malformations of the rectum.

Hemoglobin.

The quantitive determination of hemoglobin must be made with fresh blood, whatever the method used. The Tallqvist hemoglobinometer is the cheapest and simplest instrument on the market, consisting merely of a color scale and special filter paper. The blood is absorbed by a small piece of the filter-paper, and after the glazed surface has disappeared by the blood soaking into the paper, the spot is compared with the various colors of the scale in *daylight*, until the shade is approximately matched. The error of this method is about 5 per cent. This error may be reduced by taking care to have the drop of blood on the filter-paper at least twice as large as the ring through which the comparison of the colors is made.

The Dare hemoglobinometer is a simple and satisfactory instrument, but is expensive and easily broken. It has the advantage that it may be read by *artificial light*. In this instrument the fresh blood is compared with a colored glass picture wedge. With practice the error of the instrument is less than 5 per cent.

The Fleischl-Miescher hemoglobinometer is expensive and rather difficult to use, but probably is the most accurate instrument at our command and is generally found in well-equipped laboratories.

For the first few days after birth the hemoglobin percentage is high, and then sinks so that it is lower in the first year of life than later, according to Perlin varying from 58 to 78 per cent. by the Fleischl-Miescher hemoglobinometer. After the nursing period, it gradually rises to 75-85 per cent. in the sixth year, reaching the average for adults at about the tenth year.

Red and White Blood Counts.

In making the red and white count, fresh blood must be used. The blood is drawn into a pipette and diluted 1:10 for the white cells and 1:100 for the red cells. It is best to make the count immediately, but by passing a rubber band around the ends of the pipette it may be carried for some time, especially if Hayem's* solution is used. The error in counting the red cells in one hundred squares is 5 per cent. or over. To reduce this error to 3 per cent., 400 squares should be counted. In the white blood count 200 leukocytes must be counted to bring the error under 5 per cent.

* Mercuric chloride, 0.5 gram; sodium sulphate, 5 grams; sodium chloride, 1 gram. Aq. dest 200 c.c.

Red Cell Count in Early Life.

In early life the average number of red-blood-cells is somewhat higher than in the adult. During the nursing period it averages about 5,580,000, with a maximum during the first week of life. In the second year the number is about 5,680,000, and from the second to the sixth year the average is rarely under 5,900,000, girls showing a slightly lower count than boys. In infants and young children from day to day a fluctuation of a million cells may occasionally be found.

White Cell Count.

The white cell count in infants and young children is very different from that of the adult, as may be seen from the following table:

Age	Average number of leukocytes	Maximum number of leukocytes	Minimum number of leukocytes
At birth	15,000-19,000	....	....
Nursing period	12,000	16,000	8,600
1-6 years	9,000	13,000	6,900
6-13 years	7,000	12,000	5,400

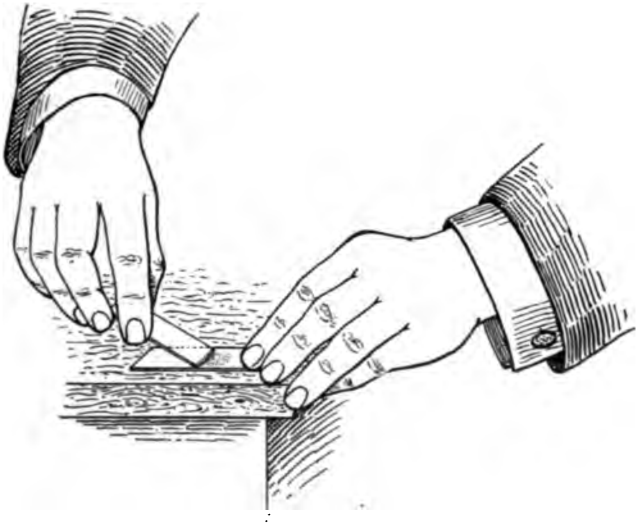


Fig. 20.— Method of making blood smear.

The blood of children is much more sensitive to sitmuli than is the case in adults, so that there is occasionally a very high leukocytosis, from a small cause, as for instance a leukocytosis during digestion of 20,000-25,000. Any increase in the leukocytes over the maximum given in the table above is to be looked upon as pathological and at least requires an explanation.

A well-marked (polynuclear) leukocytosis is to be expected in scarlet fever, erysipelas, diphtheria, pneumonia, acute articular rheumatism, tuberculous meningitis, and suppurative conditions. There is only a slight leukocytosis in typhoid, roetheln, mumps, malaria, and uncomplicated tuberculosis, except when it invades the meninges or serous surfaces, or when it becomes complicated with a septic condition. There is also a high (lymphatic or myelogenous) leukocytosis in the leukemias. A moderate (polynuclear) leukocytosis is frequently present after ether or chloroform inhalation, after taking quinine, the salicylates, tuberculin injections, and following saline infusions. Even more important than the leukocyte count is the making of a differential count.

Blood Smears.— An important point in making a good smear is to have a clean slide. If new slides are used it is usually sufficient to breathe on them and polish them off with a dry towel, but old slides must first be cleaned with acid. One end of a slide is just touched to a drop of blood, and this slide is then gently touched to the surface of another slide at an angle of about 30 degrees. The first or smearing slide is then gently drawn over the surface of the slide on which the smear is being made, thus dragging the blood out in a broad thin film which quickly dries. The size of the drop and the speed with which the smear is made determine the thickness of the preparation, and not the pressure, which should always be light. Such a smear is used for studying the morphology of the blood-cells, in the search for malaria plasmodia, and in some regions for parasites (filaria, bilharzia, etc.).

Nucleated Red Cells in Infants.— In infants up to the eighth month it is possible to find an occasional nucleated red cell, which may be either the size of a normal red cell or from two to four times larger.

The Relation of Polynuclear-Neutrophiles to Lymphocytes During Childhood.— The relation of the neutrophiles to the lymphocytes during childhood is shown in the following table:

Age	Polynuclear-Neutrophiles	Lymphocytes
Nursing period	28%	51–59%
8th–10th month	25%	56–61%
After 10th month	36%	56%
2d year	41%	55%
6th–8th year	46%	41%
10th–14th year	55%	30%

The increase in neutrophiles occurs chiefly in the second, third, and fourth years, but an increase is noticeable up to the fifteenth year.

The disease in which there is or may be an increase of neutrophilic (polynuclears) leukocytes have already been discussed under leukocytosis and, therefore, it is only necessary at this point to indicate those conditions in which the leukocytosis is due to the increase of other cellular elements. The lymphocytes in typhoid are *relatively* increased, but emphasis should be placed on the fact that the total number of leukocytes are *decreased*, so that the white count in this condition will vary from 3,000-4,000. The increase in lymphocytes is chiefly important in the leukemias — a rare condition in children and when present usually of the chronic lymphatic variety. The diagnosis of the condition depends upon repeated leukocyte counts of 30,000 (generally 100,000) or more, made up almost entirely of lymphocytes, or myelocytes and lymphocytes. Von Jaksch's anemia or infantile pseudoleukemia resembles both pernicious anemia and leukemia. It is characterized by a marked anemia, enlarged spleen and (occasionally) liver, enlargement of the lymph nodes, and by an increase in the leukocytes to 20,000 or 50,000 (rarely 100,000) per cubic millimeter. There are many nucleated red cells of both the normoblastic and megablastic type. The leukocytes are chiefly mononuclear in form, and myelocytes are present in moderate numbers. It is probably a severe form of secondary anemia.

Eosinophilia.— The eosinophiles average in health from 2 to 4 per cent. of the total white cell count. In infancy, according to Wood, the maximum is 7.5 per cent. and the minimum 0.5 per cent. The same authority states that during childhood the maximum is 12.5 per cent. and the minimum 0.7 per cent. In bronchial asthma there may be an eosinophilia of 10 to 30, or even 50 per cent. Scleroderma has been known to give an increase to 10 per cent. Intestinal parasites sometimes cause an eosinophilia as high as 75 per cent., especially in the early stages of the infection, only to fall back to normal or nearly normal later. In scarlet fever a moderate eosinophilia is present, in contrast to measles in which no such phenomenon is observed.

Malaria.— The diagnosis of malaria can be made by finding the plasmodia in the blood. These plasmodia are present in largest numbers just previous to or at the time of the chill, but in the quartan and tertian types a few may be found at any time. In the estivo-autumnal form of malaria it is often necessary to search for a long time before the plasmodia are found. In some cases of malignant malaria (black-water fever) the plasmodia disappear entirely from the peripheral circulation. Even one-half of a gram of quinine is sufficient to nullify a most careful search for the plasmodia, so that a negative result under these circumstances is of little value.

The Widal Test for Typhoid.

Preparation of Blood.— In making a Widal test either a dried specimen of the blood may be used or, better still, the serum. In obtaining a dried specimen of blood the finger is pricked with a needle, preferably a Hagedorn needle, and a very small drop of blood is placed on a clean side and allowed to dry. Several such drops should be made in order to give the pathologist a choice and also to avoid losing the specimen through error or breakage. Blood serum is to be preferred because it is more accurate for the making of dilutions. The method of collecting the blood is the same as that described later under the Wasserman-Noguchi test.

Dilutions.— The pathologist should always state the dilution made, and if there is a positive result with 1:20 a dilution of 1:40 and 1:60 should be tried. Rarely there is a positive result in dilutions of 1:20 in normal blood. With dilutions of 1:60 for one hour Wood obtained only 10 per cent. of positive results during the first week, but many of these cases gave good agglutinations in one hour in dilutions of 1:20. In the second week the reaction was present in about 80 per cent. of the cases, using a dilution of 1:60 for one hour. During the fourth week 8 to 9 per cent. more of these cases gave positive results. Taking the whole course of the disease, only 1-2 per cent. of the cases failed to react when the blood was frequently tested. Agglutnations to this degree, *e. g.*, 1:60 for one hour, may be present for only a few days and then become weaker. Libman states that he has never failed to obtain a positive reaction some time during the course of the disease, using a dilution of 1:20.

The Widal reaction appears so late in dilutions which are absolutely diagnostic that it is of little value in the early diagnosis of an active and well-marked typhoid. If, however, the clinician is in a position to interpret the test, very suggestive results are often obtained during the first week. A Widal has a great value in the diagnosis of obscure and ambulent cases, and in children where the symptoms referable to the intestinal lesion are not prominent.

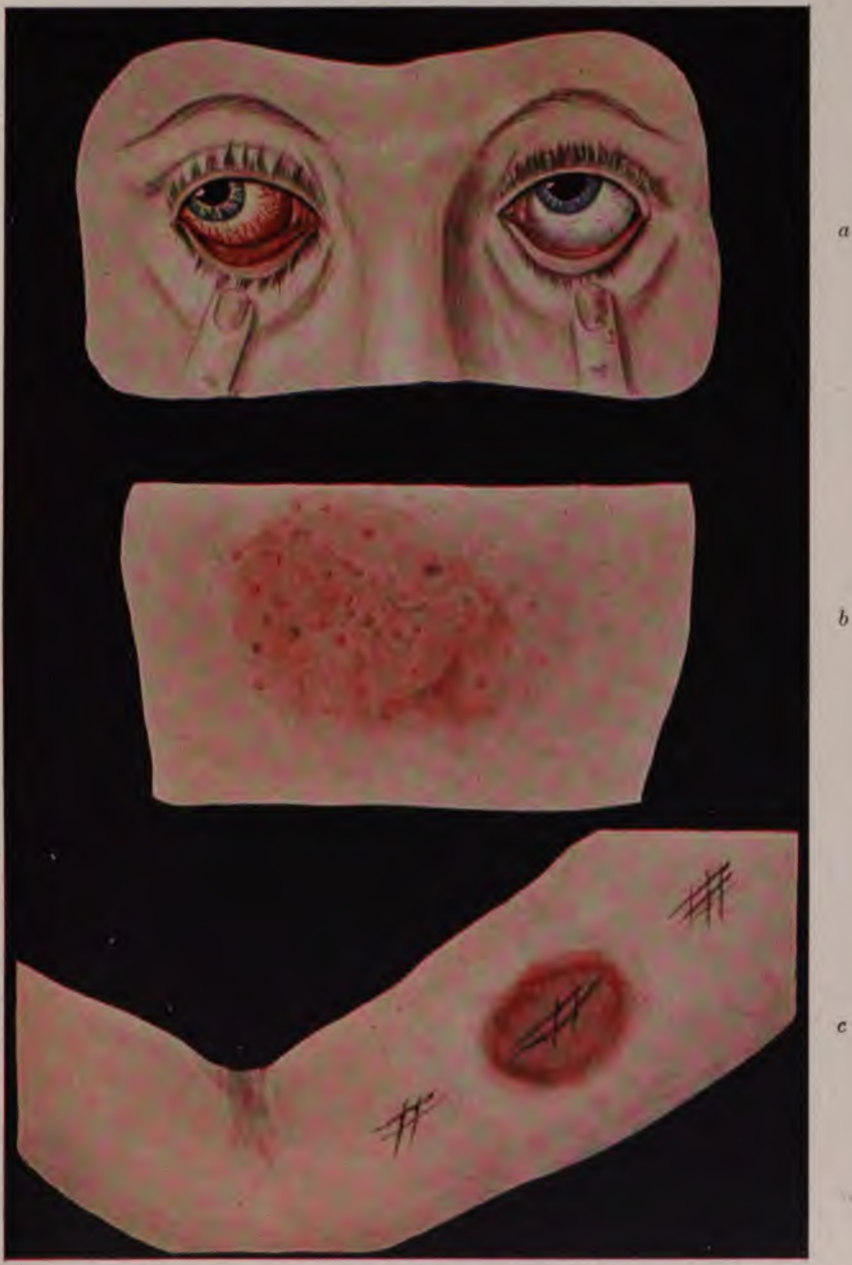
Tuberculin Tests.

One of three tests may be selected for use in suspected tuberculous children. The skin test was superseded by the eye test and inunction test, but to-day it has the greatest number of advocates, since it is the most reliable and at the same time least annoying to the patient. The test is of the greatest value in children under the age of five, for it then denotes with a fair degree of certainty that there has been or is an active tuberculous process going on. A positive reaction is proportionately valuable to the age of the patient. The younger the child the more valuable the sign. The rapidity of the appearance of the reddened zone is also proportionate to the severity of the process. The reactions are usually graded for purposes of comparison as mildly positive, positive, and strongly positive.

Skin or Von Pirquet Test. (Plate IV.)

This is made by cleansing the forearm with ether, scarifying three small areas on the arm, as for vaccination, and inoculating the central one with a drop

PLATE IV.



The ocular, percutaneous and cutaneous tests. (*a*) ocular reaction; (*b*) inunction or Moro reaction; (*c*) cutaneous or Von Pirquet reaction.

of Koch's old tuberculin (obtainable in the market), using the upper and lower areas as controls. In from twelve to forty-eight hours (occasionally even longer) a reaction will be observed in tuberculous individuals. At first a reddened blush appears which soon becomes inflamed and resembles the first stages of a successful vaccination. The controls should show no reaction. In advanced cases the reaction usually fails, due to the presence of numerous antibodies in the blood of the child; it may be negative in cases of marked anemia, in very acute disease, and in mixed infections complicated by acute diseases.

The Calmette or Eye Test. (Plate IV.)

In selected cases in which we are positive that the eye is normal, one drop of a 1 per cent. solution of tuberculin for older children and a 1/2 per cent. for infants, is dropped on the lower lid of one eye and the eyelid held down for a moment before allowing the eye to close: the closure should not be spasmodic, but gentle; it is better to gently massage the eyelids over the eyeball for a moment.

A positive reaction is indicated by a feeling of annoyance in the eye which ensues in from six to twenty-four hours, or even after two days. The palpebral or ocular conjunctiva becomes injected, later the caruncle is swollen, and, in intense reactions, an exudate is observed. The patient complains of having a " cold in the eye." The symptoms soon diminish, so that in four to five days the eye is quite normal again.

The indiscriminate use of this test has led to reports of corneal ulceration. The severity of the reaction is no criterion for the intensity of the infection. Severe reactions may follow in incipient cases. As in the skin test, active and latent cases will react, but those far advanced may give a negative test. It should be remembered that no immunity to tuberculin is produced by these tests; the other eye will react; a skin test or inunction test can be subsequently made in the same individual. This test has been quite superseded by the Von Pirquet test in this country.

The Inunction or Moro Test. (Plate IV.)

The Moro reaction is obtained by using a 50 per cent. tuberculin and lanolin ointment, and vigorously rubbing a piece the size of a split pea for a few moments over the site selected; this may be, for example, the axillary or the interscapular region. A maculopapular eruption is produced in the tuberculous at the anointed area in from twelve to twenty-four hours. It may persist for five days to over a week, and in neurotic children may appear on the opposite side of the body. The test is simple, easily performed and commends itself for use with intractable children.

The following table, by Von Ruck, shows that the cutaneous test more nearly approximates in its result to the sub-cutaneous than does the conjunctival.

	Cases	Tuberculous Per cent.	Number giving reaction	
			Suspects Per cent.	Non-tuberculous Per cent.
Subcutaneous	7088	89–88	63–34	51–30
Conjunctival	6449	79–20	57–80	13–73
Cutaneous	6504	85–59	67–48	31–62

Method of Collecting the Serum for the Wassermann Test.— Only about 2 c.c. of the patient's blood is needed. A convenient method is to puncture the finger with a Hagedorn needle or a sharp-pointed scalpel. The blood can be driven toward the extremity of the finger by coiling around it tightly a small rubber tube or band. This may be repeated several times, allowing the hand to hang down previously to each winding for a few seconds.

The blood is collected into a glass tube of rather large lumen, drawn out at either end into a capillary tube. During collection utilize both capillary attraction and gravity by holding the tube downward, or, better still, gentle suction can be made. After the blood is collected the two ends of the tube are sealed over a flame (alcohol lamp).

Considerable blood may be collected by compressing a vein of the forearm and pricking it with a sharp needle. Another method is to push into a vein a small sterile aspirating needle, such as is used in blood culture work. Small bottles (2 to 4 c.c.) with a rubber or cork stopper and sealed with paraffin make convenient receptacles for the blood, if it is impossible to obtain the tubes already described. The first method described is simple, and yet it does seem to require practise to obtain a sufficient amount of blood for the test. On the other hand, almost anyone can fill a 2 to 4 c.c. bottle by pricking a vein or by making a small incision.

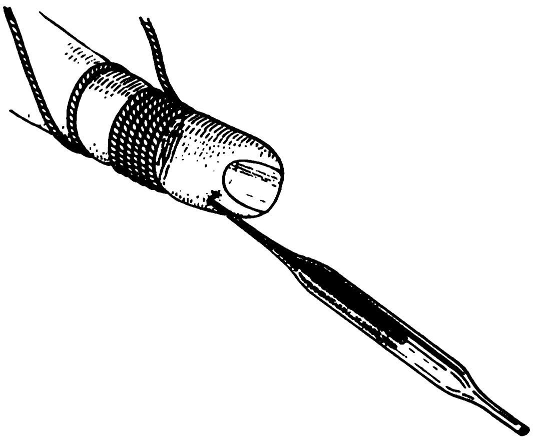


Fig. 21.

The blood, if properly sealed, will keep for a number of days even at ordinary temperatures (four to five days at least). If kept in an ice-box, for even a longer time.

Syphilis and the Wassermann Reaction.—The clinical aspects of the Wassermann reaction may be summed up as follows:

1. The Wassermann-Noguchi test has not superseded the original Wassermann test.
2. The Wassermann and Wassermann-Noguchi test must be done by men especially trained for the work to obtain reliable results.
3. A positive Wassermann or Wassermann-Noguchi *is* positive. The only other diseases which give a positive reaction are leprosy and yaws, and very rarely one of the infectious diseases.
4. A negative Wassermann does not necessarily mean that the patient is cured or has not a syphilitic infection. It is probable that a certain number of syphilitics give a negative reaction; this is especially true of those cases which are known as latent syphilis. Active syphilis is nearly always positive.
5. In hereditary syphilis those children born without symptoms may give a negative reaction until just previous to the appearance of symptoms. If born with symptoms the reaction is at once positive.

6. Under treatment with mercury or iodides the reaction generally becomes weaker and weaker, and finally disappears. The reaction may become positive again if treatment is stopped for a few days or weeks. In some cases, especially congenital syphilis, it is extremely difficult to make the reaction disappear under treatment.

7. Children born of syphilitic parents under treatment may or may not give a positive reaction. It is certain that a few of these children escape infection.

8. Frequently the last child or children which manifest no symptoms, though born of syphilitic parents, are negative to the Wassermann reaction.

9. While the mothers of syphilitic infants may present no signs of syphilis, yet examination of the blood of the mothers gives a positive reaction in half the number of cases examined. The negative reaction in the other half is due to the latency of the disease. Enough has been accomplished to throw doubt upon the dictum of Colles, and it can be said that the mother of a syphilitic child has syphilis.

Luetin Test.

Luetin Test.— Brown found that in 10 untreated children only 6 were positive, but the 24 treated all gave a positive reaction.

Noguchi says that in children the reaction as a rule is negative, but as soon as intensive treatment is started the number of positives becomes very high. He obtained 90 per cent. positive reactions under these conditions in children from 2 months to 2 years old.

He claims the test is dependent upon the formation of anti-bodies and that it is truly specific. A positive reaction should not be looked for early in the disease. That it appears comparatively late and persists for some time after the Wassermann has become negative. The test is often not easily read, being in this respect like the doubtful von Pirquet test. It is feasible to repeat the test after a few weeks. A diagnosis of syphilis on the basis of a positive luetin test alone should not be made. As a confirmatory test it is valuable. Where there is a definite undoubted history of syphilis with a negative Wassermann a positive luetin test would call for further treatment.

Technic.— The luetin is injected beneath the superficial layer of the skin (never beneath the true skin), with a small syringe and fine needle. The latter is held close to, and parallel with, the surface of the arm, and inserted for about a third of an inch. The luetin should then be very slowly injected.

Luetin is an emulsion which contains the organisms of syphilis as well as the products of their metabolism.

In the unaffected a small erythematous area appears about 24 hours after the injection, and disappears within 48 hours, leaving practically no effect. While affected individuals may show a reaction of a papular, pustular, or a torpid form.

CHAPTER VIII.

SIGNS OF ILLNESS IN INFANCY.

As it is by no means easy in every case to tell exactly when or how an infant begins to be ill, a close observation of symptoms and their proper interpretation becomes highly important. Slight causes often produce very marked and sudden effects at this time of life. This is explained by the active growth of infants and especially by the rapid development and irritability of the nervous system. Thus a really slight indisposition may present the appearance of severe disease, while the converse of this is sometimes true, as serious illness may so blunt this delicate nervous susceptibility as to cause the true gravity of certain cases to be overlooked. Attention may be called to various conditions that are evidences of some disturbance, and to note what they usually signify.

Irritability of Temper.—In the absence of speech, the infant shows discomfort or suffering principally by cries and restlessness. If watched closely, it may by certain signs indicate to some extent the seat of the trouble. In headache, the hand will be frequently raised and held beside the head; in earache, the hand will be carried to the ear, and often pull upon that organ; in difficult and painful dentition, the fingers will be constantly inserted in the mouth, as if to pull out the cause of the distress; irritation of the stomach and bowels may be accompanied by a continual rubbing of the nose. During an attack of colic, the legs are drawn up over the abdomen, which feels hard, and there is likewise a writhing motion of the body. Crying is a very constant accompaniment of all kinds of illness. Constant, uninterrupted crying is usually caused by earache, hunger, or thirst. If, after giving the baby suitable nourishment or a drink of water, it still keeps up a continuous, almost automatic cry, there is probably severe pain in the ear. This may be confirmed by pressing in front and behind this organ, when the baby will wince. Where there is some disease in the head a sudden piercing cry is uttered at certain intervals, between which there will probably be no fretting. In pneumonia, there is crying only during spells of coughing and a short time after; in pleurisy, there is likewise crying only during coughing, but it is shriller and shows more suffering than in pneumonia, and is also produced by moving the child and pressing over the affected side. Crying just before or after a movement of the bowels, with a twisting of the pelvis, gives evidence of intestinal pain.

Where the hand is tightly shut, with the thumbs thrust deeply into the palms, and the toes strongly bent, there is much nervous irritation, which may eventuate in a convulsion.

RESTLESS SLEEP.—Much may be learned by a careful inspection of an infant during sleep. A well child always sleeps quietly, but, when ill, sleep is fitful and sometimes only possible when the infant is rocked or patted or carried about in the arms. If there is a constant kicking off of the bedclothes, so that the child will not long keep covered even in cold weather, it is a pretty sure indication of rickets. When it is impossible for a child to sleep unless the head and shoulders are raised high upon a pillow, there is usually some disturbance in the action of the heart or lungs. If a child sleeps with its mouth wide open and the head thrown back, there is enlargement of the tonsils or adenoid tissue at the vault of the pharnyx interfering with natural quiet breathing through the nose. A persistent boring of the back of the head into the pillow points to cerebral irritation. When sleeping with half-open eyes, there is apt to be moderate pain present, and, if there is a constant movement of the lips, the discomfort is located in the gastro-intestinal canal.

CHANGES IN THE FEATURES.—When illness is present, it is quickly shown in the countenance of the infant, which, during health, is in a condition of easy repose. In general, it can be stated that the upper part of the face is involved in diseases of the head, the middle part in affections of the chest, and the lower part in disturbances involving the abdominal organs. Thus in disease of the brain, the forehead and eyebrows will be sharply contracted, and the eyes sensitive to light with various changes in the pupils. Puffiness and swelling about the eye-lids point to dropsy, which is usually caused by diseases of the kidneys following scarlet fever of other infectious process, but occasionally by severe anemia. In pneumonia and pleurisy the nostrils are sharply defined, and dilate and contract with the movements of respiration which will appear more or less labored. The mouth is the feature most affected in abdominal disease, shown by a drawing of the upper lip and other movements indicating pain.

STATE OF THE DISCHARGES.—A careful examination of all the organs opening upon the surface of the body must be made to detect any abnormal discharges. The ears, eyes, nose, mouth, urinary and rectal regions must thus be carefully inspected.

During infancy vomiting is a frequent and early symptom when the stomach is distended. In such a case there may be a regurgitation of some slightly curdled milk after each feeding. The infant shows no distress from this act and continues in a good condition of health; the stomach simply rejects any excess of food above that which it can readily hold. But sudden and profuse vomiting, without any error in diet, may constitute the beginning of severe illness, such as scarlet fever, diphtheria, or some brain disease. Acute illness in early life may begin with vomiting in place of the chill seen in older subjects. Vomiting may simply be a sign of local disturbance in the stomach, as when mucus is ejected in cases of gastric irritation. Where tough curds are vomited with the milk very sour, there is evidence of fermentation of the milk and an overacid condition of the stomach. If this persists, the mouth will become red and sore from a direct continuity of the irritation.

Much can be learned by investigating the number and character of the discharges from the bowel. During the first two months there are usually three or four stools in the twenty-four hours, and during the first two years two stools a day on the average. The stools are homogeneous, of a soft, semisolid consistency, and of yellowish color. In cases of diarrhea or inflammation they may be green, or contain hard, lumpy curds, or have an admixture of mucus and blood, or be of very watery consistency. Abnormal stools will be considered more at length in the section devoted to diarrhea.

The urine is passed many times in the twenty-four hours, and the diaper may have to be changed as often as every hour. Infants vary in this, however, as they may go six or eight hours without voiding urine. If twelve hours pass without it, a careful examination must be made in order to reveal the cause of retention. In some cases where the urine is highly acid, it may be expelled when a few drops collect in the bladder, and, as this amount quickly dries in the diaper, there is no evidence from wetting that urine has been passed. A dark, smoke-colored urine may indicate nephritis, and thus be of great significance. Scanty urine, loaded with uric acid and the urates, may leave a red deposit upon the napkin simulating blood.

CHAPTER IX.

GENERAL THERAPEUTICS.

Under this heading will be described methods and means of treatment that are ordinarily employed in pediatric practice.

As these various measures are used in a number of conditions, it is advisable to discuss them at some length and later refer to this chapter when outlining the treatment for a certain disease.

Drug Administration.

Never prescribe a drug without a good and sufficient reason. Prescribe so that the dose will be small in amount and as agreeable as possible. Heavy syrupy mixtures may be agreeable, but are apt to give rise to fermentation from excess of sugar. Pills and capsules are not intended for children who rarely can swallow them. Prescriptions should be simple and if possible contain but one or at most two drugs. Powders made up with sugar of milk are mixed with water and given from the teaspoon. Tablet triturates form an easy and accurate method of giving drugs. If the child is unwilling the medication on the spoon is quickly slipped on to the tongue and the spoon held in position well back until swallowing takes place. In this way the child cannot regurgate it.

Begin with small doses in early life and increase if the desired effect is not obtained. Heroic doses, however, may be used in emergencies where rapid and active stimulation is required. Hypodermatic injection of the stimulant is often required to produce physiologic effects.

Bastedo's rule which was deduced from tables of weights of normal children of different ages is as follows:

$$\text{Multiply the adult dose by } \frac{\text{age} + 3}{30}$$

In other words, in writing for thirty doses, for example, a four ounce mixture with teaspoonful dose, put down as many minims or grains as the age plus three. In writing for fifteen doses (2 oz. mixture) put down half as many minims or grains as the age plus three. In the metric system, for thirty doses, put down the adult dose X (age + 3) × 3, and move the decimal point two places to the left.

This seems to be an advantage over Young's and Cowling's rule and furthermore meets with the approval of pharmacologists.

Castor oil should be administered ice cold on a wet spoon. The taste of quinine in solution may be disguised with syrup of yerba santa, extract of licorice or syrup of wild cherry, but it is not unusual to find children who take bitter medication better than adults. Tasteless quinin in the form of euquinin, tannate of quinin, or saccharated quinin is now obtainable. Sweet chocolate disguises the taste admirably. Opium or its derivatives, with the exception of codein, are to be largely avoided. The coal-tar derivatives, combined with caffein, are used at times to control pain. They should be given in small doses, and not as a routine measure for the control of pyrexia.

The drugs or preparations of drugs most frequently used internally with the greatest advantage in pediatric practice are:

Calomel
Castor oil.
Fowler's solution.
Basham's mixture
Bismuth subnitrate
Bromides
Cascara sagrada
Cod liver oil
Strychnin sulphate
Digitalis.
Syrup of iodid of iron
Tincture of nux vomica.
Salicylates.
Alcohol.
Potassium iodid.
Ammonium compounds.
Atropin.
Camphor.
Chloral hydrate.
Codein phosphate.
Dover's powder
Hexamethylenamin.
Hydrochloric acid.
Liquorice powder.
Phenacetin.
Rhubarb.
Salol.
Iron compounds.
Asafetida.
Santonin.
Aspidium.
Ipecac.

TABLE OF AVERAGE DOSAGE.

Drug	Dose. Age 6 mos.	Dose. Age 2 yrs.	Dose. Age 3 to 5 yrs.	Dose. Frequency.	Dose. Maximum in 24 hrs. Age 5 yrs.
[illegible] 10 per cent	gtt. [illegible]	gtt. [illegible]	gtt. 1-2	q. 2-4 hrs.	♏ 2-6
Ammonium Chlorid	gr. [illegible]	gr. [illegible]	gr. 1-2	q. 2-4 hrs.	gr. 12-24
Ammonium Carbonate	gr. [illegible]	gr. [illegible]	gr. 1-2	q. 2-4 hrs.	gr. 12-24
[illegible]					
[illegible]	gr. [illegible]	dr. [illegible]	dr. [illegible]	q. 4 hrs.	dr. 3-6
[illegible]	gr. [illegible]	gr. [illegible]	gr. [illegible]	[illegible] 4 hrs.	dr. 1-1½
[illegible]	gr. 1-2	gr. [illegible]	gr. [illegible]	[illegible]	[illegible]-dr. 1
[illegible]	gr. [illegible]	gr. [illegible]	gr. 2-3	[illegible]	gr. [illegible]-10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE OF AVERAGE DOSAGE.—*Continued.*

Drug.	Dose, Age 6 mos.	Dose, Age 2 yrs.	Dose, Age 3 to 5 yrs.	Dose, Frequency.	Dose, Maximum in 24 hrs. Age 5 yrs.
Asafetida, Milk of, by rectum only	dr. 1	dr. 1–2	dr. 1–2	pro doso	dr. 2
Aspidium Oleoresin		♏ 10	♏ 30	once	♏ 10–30
Aspirin	gr. 1	gr. 1–2	gr. 3–5	q. 4. hrs	gr. 15–20
Atropin	gr. 1/500	gr. 1/300	gr. 1/200	q. 4 hrs.	gr. 1/50
Basham's Mixture		dr. ½	dr. 1	t.i.d.	oz. ½
Belladonna Tinct.	gtt. ¼	gtt. 1	gtt. 2–5	q. 4 hrs.	♏ 5–10
Beta-naphthol	gr. ¼	gr. ½	gr. 1	t.i.d.	gr. 3
Benzoic Acid	gr. 1	gr. 2	gr. 3–5	q. 4 hrs.	gr. 5–10
Bismuth Subcarbonate	gr. 5	gr. 10–15	gr. 15–30	p.r.n.	dr. 2–3
Bismuth Subgallate (Dermatol)	gr. 2–3	gr. 5–10	gr. 5–10	p.r.n.	dr. 2½
Bismuth Subnitrate	gr. 5–10	gr. 10–15	gr. 10–30	p.r.n.	oz. ½
Bismuth Salicylate	gr. ½–1	gr. 1–2	gr. 2–3	p.r.n.	gr. 5–15
Brandy (Cognac)	gtt. 5–10	gtt. 10–20	gtt. 20–30	q. 3 hrs.	dr. 1–oz. ½
Bromide, Ammonium Bromide, Potassium Bromide, Sodium Bromide, Strontium	gr. 1–3	gr. 3–5	gr. 5–8	q. 4 hrs.	gr. 25–40
Brown Mixture (see Licorice Comp. Mixt.).					
Caffein Citrate	gr. ⅛–¼	gr. ¼–½	gr. ½	q. 4 hrs.	gr. 2
Calcium Chlorid	gr. ½	gr. 1	gr. 2	t.i.d.	gr. 4–6
Calcium Sulphid	gr. 1/30	gr. 1/20	gr. 1/10	t.i.d.	gr. 1/10–⅓
Calomel	gr. 1/10–½	gr. ¼–1	gr. ¼–2	in divided doses	gr. ½–2
Camphor, Pulverized	gr. 1/10–¼	gr. ¼	gr. ¼	q. 2–4 hrs.	gr. ½–1
Camphor Spts. 10 per cent.		gtt. 5	gtt. 5–10	t.i.d.	♏ 10–30
Cascara Sagrada, Ext.		gr. ½	gr. 1–2	t.i.d.	gr. 2–5
Cascara Sagrada, Fluid Ext.		gtt. 5.	gtt. 5–10	t.i.d.	dr. ½
Castor Oil	dr. 1.	dr. 1–2	dr. 1–4	pro doso	oz. ½
Cerium Oxalate		gr. 1–2	gr. 2–3	t.i.d.	gr. 5–10
Chalk, Prepared	gr. 2	gr. 3	gr. 5–8	q. 4 hrs.	gr. 20–30
Chalk Compound Mixt.	dr. 1	dr. 1	dr. 1–2	q. 3 hrs.	oz. 1
Chloral Hydrate	gr. ½	gr. 1–2	gr. 2–3	q. 4 hrs.	gr. 5–10
Chloroform Spirits	gtt. 1–2	gtt. 2–3	gtt. 5–10	q. 4 hrs.	dr. ½
Cinchona (see Quinin).					
Codein	gr. 1/30	gr. 1/20	gr. 1/10	q. 4 hrs.	gr. ¼–⅗
Cod-liver Oil	dr. ¼	dr. ½	dr. 1–2	t.i.d.	oz. ½–1
Creosote		gtt. 1–2	gtt. 2–3	t.i.d.	gtt. 5–10
Creosote Carbonate		gtt. 1–2	gtt. 2–3	t.i.d.	gtt. 5–10
Digitalis, Tinct.	gtt. ½	gtt. 1–2	gtt. 2–3.	q. 4 hrs.	gtt. 5–15
Digitalis, Infusion	gtt. 10	dr. ½	dr. 1–3	t.i.d.	dr. 3–oz. 1
Digitalin	gr. 1/300	gr. 1/150	gr. 1/150	p.r.n.	gr. 1/50
Dover's Powders (see Opium Powder of Ipecac).					
Dionin	gr. 1/50	gr. 1/25	gr. 1/10	t.i.d.	gr. ½
Ergot, Fluid Extract	gtt. 2–3	gtt. 5	gtt. 10–15	t.i.d.	dr. ½
Ether, Compound Spts. (Hoffman's Anodyne)	gtt. 2	gtt. 5	gtt. 10	p.r.n.	dr. ½
Ether, Nitrous Spts. of (Sweet Spirits of Niter)	gtt. 2	gtt. 5	gtt. 10	q 1–2 hrs.	dr. 1½
Ferric Prep. (see Iron.)					

TABLE OF AVERAGE DOSAGE.—*Continued.*

Drug.	Dose, Age 6 mos.	Dose, Age 2 yrs.	Dose, Age 3 to 5 yrs.	Dose, Frequency.	**Dose, Maximum in 24 hrs. Age 5 yrs.**
Fluoroform (2.8 per cent. sol.)	gtt. 1	gtt. 2	gtt. 6.	q. 2 hrs.	**gtt. 48**
Fowler's Sol. (see Arsenic Liq. Potass.					
Glauber's Salts..............	....	gr. 30	dr. 1	pro doso	**dr. 1–3**
Glonoin (Nitroglycerin)......	gr. $\frac{1}{400}$	gr. $\frac{1}{300}$	gr. $\frac{1}{200}$ to ——	q. 2–4 hrs.	**gr. $\frac{1}{50}$–$\frac{1}{25}$**
Glonoin (Spts. of)...........	gtt. $\frac{1}{4}$	gtt. $\frac{1}{2}$	gtt. 1	q. 2–4 hrs.	**gtt. 4–8**
Guaiacol Carbonate.........	gr. $\frac{1}{4}$	gr. 1	gr. 5	q. 4 hrs.	**gr. 20**
Heroin Hydrochlorid.........	gr. $\frac{1}{100}$	gr. $\frac{1}{50}$	gr. $\frac{1}{40}$	q. 4 hrs.	**gr. $\frac{1}{12}$**
Hexamethylenamin (Urotropin).....................	gr. $\frac{1}{2}$	gr. 1	gr. 2–5	t.i.d.	**gr. 5–15**
Hoffmann's Anodyne (see Ether Spts. Comp.).					
Hydrochloric Acid, Dilute....	gtt. $\frac{1}{2}$	gtt. 2	gtt. 5	t.i.d.	**gtt. 15**
Hyoscyamus Tinct...........	gtt. $\frac{1}{2}$	gtt. 2	gtt. 3	t.i.d.	**gtt. 10**
Hydrargyrum (see Mercury).					
Iodid, Sodium, and Potassium.	gr. 1	gr. 2	gr. 3	t.i.d.	**gr. 5–10**
Iron.					
Iron, Oxid Saccharated.......	gr. 1	gr. 2	gr. 5	t.i.d.	**gr. 3–15**
Ferric Chlorid, Tinc	♏ $\frac{1}{2}$	♏ 1	♏ 3	t.i.d.	**♏ 10**
Liq. Ferri et Ammonium Acetatis (see Basham's Mixt.).					
Soluble Citrate of Iron Ferri et Ammonii Citras)..	gr. $\frac{1}{4}$	gr. 1	gr. 3	t.i.d.	**gr. 3–10**
Syrup of Iodid of Iron.......	....	gtt. 5	gtt. 5–10	t.i.d.	**gtt. 15–dr. $\frac{1}{2}$**
Pyrophosphate of Iron, (Soluble) Elixir of..........	....	♏ 5	♏ 15	t.i.d.	**♏ 45**
Reduced Iron...............	....	gr. $\frac{1}{2}$	gr. 1	t.i.d.	**gr. 3**
Liq. Ferri Peptonati (N. F.)	♏ 5	♏ 10	♏ 30	t.i.d.	dr. 1$\frac{1}{2}$
Ipecac, Wine of (Emesis).....	gtt. 5	dr. $\frac{1}{2}$	dr. $\frac{1}{2}$-1	q. $\frac{1}{2}$ hrs. to effect	dr. 3
Ipecac, Syrup of (Expectorant)	gtt. 2	gtt. 3	gtt. 5	q. 4 hrs.	dr. $\frac{1}{2}$
Jalap, Powdered..........	gr. $\frac{1}{2}$	gr. 2	gr. 3	once	gr. 3
Licorice Compound Mixture Brown Mixture	gtt. 15	gtt. 20–30	gtt. 30–40	q. 3 hrs.	dr. 2–oz. $\frac{1}{2}$
Liquorice Compound Powder	gr. 10	gr. 20	gr. 40–dr. 1	bed time	dr. $\frac{1}{2}$–1
Magma Magnesia (N. F.) Milk of Mag.	♏ 10	dr. $\frac{1}{2}$	dr. 1	t.i.d.	dr. 3
Magnesium Citrate (Liq. Magnesia Citrate Effervescent).	oz. $\frac{1}{2}$	oz. 2	oz. 4	in A. M.	oz. 6
Magnesium Sulphate........	gr. 15	gr. 30	gr. 60	in A. M.	dr. 1
Male Fern, Oleoresin (see Aspidium).					
Mercury Bichlorid...........	gr. $\frac{1}{200}$	gr. $\frac{1}{100}$	gr. $\frac{1}{60}$	t.i.d.	gr. $\frac{1}{15}$
Mercury Mild Chlorid (Calomel)..................	gr. $\frac{1}{10}$–$\frac{1}{2}$	gr. $\frac{1}{4}$-1	gr. $\frac{1}{4}$–2	in divided doses	gr. $\frac{1}{2}$–2
Mercury Biniodid...........	gr. $\frac{1}{150}$	gr. $\frac{1}{50}$	gr. $\frac{1}{25}$	t.i.d.	gr. $\frac{1}{5}$
Mercury with Chalk (Gray Powder)................	gr. $\frac{1}{4}$	gr. $\frac{1}{2}$	gr. $\frac{1}{2}$-1	t.i.d.	gr. 3
Morphin Sulphate...........	....	gr. $\frac{1}{50}$	gr. $\frac{1}{25}$	p.r.n.	gr. $\frac{1}{10}$

TABLE OF AVERAGE DOSAGE.—*Continued.*

Drug.	Dose, Age 6 mos.	Dose, Age 2 yrs.	Dose, Age 3 to 5 yrs.	Dose, Frequency.	Dose, Maximum in 24 hrs. Age 5 yrs.
Niter, Sweet Spirits of (see Ether Spts. Nitrous).					
Nitroglycerin (see Glonoin).					
Nux Vomica Tinct.	gtt. 1	gtt. 2	gtt. 3–6	t.i.d.	gtt 5–15
Novaspirin	gr. 1	gr. 1–2	gr. 3–5	q. 4 hrs.	gr. 15–20
Opium Tinct. (Laudanum)	....	gtt. 1–2	gtt. 2–3	p.r.n.	gtt. 10
Opium, Camphorated Tinct.	gtt. 3–5	gtt. 15	gtt. 20	q. 4 hrs.	dr. 1–2
Opium, Powder of Ipecac and (Dover's Powder)	gr. ⅛–¼	gr. ¾	gr. 1–2	p.r.n.	gr. 1–5
Peppermint Water (Aqua Mentha Piperita)	dr. ½	dr. 2	dr. 4	t.i.d.	oz. 1–1½
Pepsin Powdered	gr. 1	gr. 2	gr. 3	t.i.d.	gr. 5–10
Pepsin Essence of (N. F.)	gtt. 20	gtt. 30	dr. 1	t.i.d.	dr. 3
Phenacetin (Acetphenetidin)	gr. ½	gr. 1	gr. 2	q. 4 hrs.	gr. 4–8
Phosphorus					
Syr. Calcii Lactophos	gtt. 10	gtt. 30	dr. 1	t.i.d.	dr. 3
Phosphoric Acid Dil	gtt. 1–2	gtt. 5	gtt. 10	t.i.d.	dr. ½
Syr. Hypophosphites	gtt. 15	gtt. 30	dr. ½–1	t.i.d.	dr. 3
Potassium Acetate	gr. 1	gr. 3	gr. 5	t.i.d.	gr. 15
Potassium Bitartrate	dr. ½	dr. 2	dr. 4	once	oz. ½
Potassium Bromid	gr. 1–3	gr. 3–5	gr. 5–8	q. 4 hrs.	gr. 25–40
Potassium Citrate	gr. 1	gr. 2	gr. 5	q. 4 hrs.	gr. 15–30
Potassium Chlorate	gr. ½	gr. 2	gr. 3	t.i.d.	gr. 10
Potassium Iodid (Expectorant)	gr. ¼	gr. ½	gr. 1	q. 2–4 hrs.	gr. 10
Potassium Iodid (as Antisyphilitic)	gr. 1	gr. 2	gr. 3	t.i.d.	gr. 10
Quinin, Sulphate and Bisulphate	gr. ½	gr. 1–2	gr. 2–3	q. 4 hrs.	gr. 5–15
Rhubarb Powdered	gr. 1	gr. 3	gr. 5	t.i.d.	gr. 15
Rhubarb Syrup Arom.	gtt. 15	dr. 1–2	dr. 1–2	t.i.d.	oz. ½
Rhubarb and Soda Mixture	....	dr. ½–1	dr. 1–2	t.i.d.	oz. ½
Rhubarb and Anisated Magnesia Pulv. (N. F.)	gr. 3	gr. 5–10	gr. 10–20	b.i.d.	gr. 40
Salicin	....	gr. 1–2	gr. 2–3	q. 3 hrs.	gr. 24
Sodium Salicylate	....	gr. 2	gr. 3–5	q. 3 hrs.	dr. ½
Methyl Salicylate	....	gtt. 3	gtt. 5	q. 2–3 hrs.	♏ 20–30
Aspirin	gr. 1	gr. 1–2	gr. 3–5	q. 4 hrs.	gr. 15–20
Oil of Wintergreen	gtt. 1	gtt. 3	gtt. 5	q. 2–3 hrs.	gtt. 30
Salol	gr. ½	gr. 1–2	gr. 2–3	t.i.d.	gr. 10
Santonin	....	gr. ¼	gr. ½	q. 4 hrs.	gr. 1–2
Serum Antidiphtheritic (see Antitoxin).					
Serum Antimeningitic	15 c.c.	15 c.c.	30 c.c.	daily for 4 days	pro doso
Sodium Benzoate	gr. 1	gr. 2	gr. 3	q. 4 hrs.	gr. 10–15
Sodium Bicarbonate	gr. 2	gr. 3	gr. 5–10	p.r.n.	gr. 20–30
Sodium Bromid	gr. 1–3	gr. 3–5	gr. 5–8	q. 4 hrs.	gr. 25–40
Sodium Iodid	gr. 1	gr. 2	gr. 3	t.i.d.	gr. 5–10
Sodium Phosphate	gr. 15	gr. 30	gr. 60	pro doso	dr. 1
Sodium Sulphate	....	gr. 30	gr. 60	pro doso	dr. 1–3
Spartein Sulphate	gr. 1/80	gr. 1/20–1/10	gr. 1/10–1/6	q. 3 hrs.	gr. ⅕
Strophanthus Tinct.	gtt. 1	gtt. 2	gtt. 3	q. 4 hrs.	gtt. 12

TABLE OF AVERAGE DOSAGE.—*Continued.*

Drug.	Dose, Age 6 mos.	Dose, Age 2 yrs.	Dose, Age 3 to 5 yrs.	Dose, Frequency.	**Dose, Maximum in 24 hrs. Age 5 yrs.**
Strychnin Sulphate	gr. $\frac{1}{400}$	gr. $\frac{1}{200}$–$\frac{1}{150}$	gr. $\frac{1}{100}$	q. 4 hrs.	**gr. $\frac{1}{25}$**
Tanalbin	gr. 1	gr. 3	gr. 5	q. 2 hrs.	**dr. 1**
Tannigen	gr. 1	gr. 3	gr. 5	q. 2 hrs.	**dr. 1**
Tartar Emetic	gr. $\frac{1}{200}$	gr. $\frac{1}{150}$	gr. $\frac{1}{100}$	q. 4 hrs.	**gr. $\frac{1}{25}$**
Terpin Hydrate		gr. $\frac{1}{4}$	gr. $\frac{1}{2}$	q. 3–4 hrs.	**gr. 3**
Thyroid Ext. Desic	gr. $\frac{1}{2}$–1	gr. 1–2	gr. 3	t.i.d.	**gr. 9**
Thymol		gr. 1–2	gr. 2–5	t.i.d.	**gr. 15**
Urotropin	gr. $\frac{1}{2}$	gr. 1	gr. 2–5	t.i.d.	**gr. 5–15**
Veronal		gr. 1	gr. 1–2	once	**gr. 2**
Whisky	gtt. 10	gtt. 10–20	gtt. 30–40	q. 4 hrs. or oftener	**oz. $\frac{1}{2}$**

Introductory Remarks.

The treatment of diseases in children requires a thorough knowledge of all measures, besides drugs, that may be used for alleviation or cure. If the medical attendant places sufficient dependence upon such measures as hydrotherapy, fresh air, and diet he will be inclined to order fewer drugs or only such as are still indicated. Familiarity with the details of the general therapeutics of childhood will make him resourceful and capable of adapting his treatment to the particular surroundings and needs of the child.

The physician should take into consideration the general developmental condition of the child, its usual habits and the intelligence of those who will carry out his orders. Orders should always be specific, and are preferably written out in detail, as a mother's anxiety for her sick child may lead to misunderstandings which may prove serious.

While many of the diseases are self-limited, and recoveries are generally speedy because of the recuperative powers in early life, still the practitioner should always alleviate distress and hasten complete recovery by the proper use of drugs and other medical measures.

Prescriptions should be simple, containing only one or two ingredients, and made as palatable as possible without endangering the child's digestion. Glycerin and saccharin will serve this purpose and are to be preferred to the syrups or sweet elixirs which so readily cause fermentation. Medication and other measures for relief should be so arranged that the child will not be continually disturbed; for rest is an important adjunct in all cases.

In the practice of pediatrics preventive treatment should be considered first, last, and all the time, for it is only thus, through the saving of lives and the rearing of healthy children who can later become healthy parents, that infant mortality can really be reduced.

Psychotherapy.

The influence that can be exerted for good or evil, over the receptive mind of a child has been well emphasized in recent years by psychologists and physicians. Often a good part of a physician's success in handling little patients is due to his knowledge and interest in their mental processes. He learns to take advantage of their susceptibility to conviction, to suggestion, or of their pride, and control is thus easily acquired. The harmful influence of certain members of the family may prevent good results, especially in neurotic diseases, until the child is removed to different surroundings. A stranger often has better control over the sick child than its own mother. Time spent in studying the mental attributes of a seemingly incorrigible patient is well spent, for almost without exception the maturer mind conquers by persistence tempered with kind indifference.

In older children hysterical manifestations can be controlled by the forceful attendant and their repetition prevented by a radical change in environment and daily routine. Such conditions as enuresis we have often been able to cure by psychic influences depending mainly upon the child's pride. Another factor often lost sight of in this connection is the influence of associates. Through a proper selection of playmates in age and temperament, much may be done from a psychic standpoint.

Aerotherapy.

It is a deplorable fact that there is any need of emphasizing the use of fresh air in the treatment of disease. The laity, however, have been so imbued for years with the idea that colds are the result of cold air, and that sickness in the house demands warm rooms that the practitioner, in spite of his better judgment, often acquiesces in these notions. Among the more intelligent of our population the need of an outdoor life is beginning to be appreciated, and it only demands that orders for sufficient fresh air be given with a spirit of conviction that the method is a right and just one, to gain the cooperation of the parents. The harmful influence of impure air or a paucity of fresh air is no better illustrated than by comparing the poor results formerly obtained in institutions and hospitals for children, even when skillful nursing was at hand, to the good results obtained with abundance of fresh air.

Aerotherapy, or an abundance of pure fresh air, should be arranged for in every sick-room as well as in the nurseries of healthy children. In respiratory diseases accompanied with fever the good effects of cool fresh air are particularly noticeable.

In convalescence a change to the country or seaside, where ozone is abundant, will do more than a course of iron tonics or artificial stimulants. The summer diarrheas are often promptly alleviated by a sojourn in a cool and dry atmosphere.

Hydrotherapy.

The use of water is safer and often more effective than the use of antipyretics in reducing temperature. It also has a tonic effect instead of the depressing effect of antipyretic drugs. A warm bath given to a child conserves the body heat, is sedative in its action, and increases the perspiration. On the other hand, cold baths decrease the body heat and leave a stimulating and eliminative action.

Sponge Baths.— Cool sponge baths with or without alcohol are effectual and usually agreeable to children when their tempearture is high. Cold baths or cold packs are rarely necessary and may be productive of considerable shock. Equal parts of alcohol and water at 90° F. are applied to the child lying in a woolen blanket; gentle friction causes air evaporation and reduction of temperature. While the bath is in progress ice cold cloths may be placed on the forehead and head of the child.

Sheet or Bed Baths.— Rubber sheeting is spread on the bed and a soft sheet or blanket is wrung out of water at 90° to 100° F. The patient is wrapped in this and cold applications at 60° F. placed to the head. In older children water at a lower temperature, 70° or 80° F., may be sprinkled over the sheet to effect a further reduction of body heat. The patient should remain in such a bath for about twenty minutes and it may be repeated several times during the day if the necessity arises.

Ice Cap.—For persistent high temperature with delirium an ice cap may be placed at the nape of the neck or on top of the occiput. The thin rubber ice bladders are half filled with small pieces of cracked ice and all air is expelled. They should be used only intermittently, and a trained attendant should be present, as all cases do not respond well to its application.

Ice Poultice.— Small pieces of cracked ice are mixed with an equal portion of bran or sawdust and wrapped in oil silk or rubber sheeting in such a way as to prevent leaking. This may be used as the ice cap above, but has the advantage that it may be improvised at home.

Compresses.— Compresses wrung out of water varying from 80° to

100° F. according to indications may be applied to the neck in tonsilitis, over the abdomen for enteralgia and about the chest in cases of pneumonia. When used on the chest they should be divided into two portions, one for the left and one for the right, so that they may be removed with as little disturbance as possible to the patient. They may also be applied to the exposed part of the chest in one piece and tucked around as far as possible without disturbing the child.

Warm and hot baths are agreeable, soothing, and sedative. The temperature of the body is reduced and the relaxation which follows promotes sleep and diuresis. A warm bath is given at a temperature of 85° to 98° F., while a hot bath may range to 110° F. The warm bath is suitable for the reduction of temperature, and should last from five to fifteen minutes. Cool applications may be placed upon the head if the pyrexia is particularly high. Hot baths should be given to asthenic infants when the temperature is high or subnormal. The addition of mustard is useful, especially if there are evidences of shock or collapse. The baths should be short, not exceeding over five minutes in duration. The patient should be wrapped in warmed woolen blankets and allowed to rest, unless free perspiration is indicated as in nephritis, when hot drinks may also be given.

A **hot pack** is useful in nephritic or uremic cases. The child is wrapped in a woolen blanket wrung out of water at 110° F. and covered with another dry one, beneath which are placed numerous hot-water bags. Hot drinks are offered. The pulse should be watched and the child removed when a free perspiration is induced.

A **hot-air bath** is given by introducing hot air from a croup kettle under the blankets of the bed for about half an hour or until free diaphoresis is obtained.

Special Baths.

A **brine bath** is given by adding a half-pound of sea salt to six gallons of water at a temperature of 105° F. and gradually reducing to 90° F. Gentle friction should be kept up throughout the bath, which should not last longer than fifteen minutes. It is indicated as a stimulating bath for undernourished, poorly developed children, especially those with tuberculous tendencies.

The addition of bran, starch or bicarbonate of soda in luke-warm water will serve to allay the irritation of certain skin diseases, as urticaria. A quarter of a pound of soda is sufficient for a six-gallon bath. When a bran bath is given half a pint of bran in a cheesecloth bag is drawn through the water. For the starch bath a quarter of a pound, or half a cup, of raw starch is slowly dissolved in the water.

A **soothing bath** which will promote sleep in nervous, irritable children is made by the addition of fifteen drops of pine-needle oil to the water at 110° F. No friction should be made.

A **mustard bath** is prepared by immersing an ounce of mustard in a cheesecloth or muslin bag in the water, usually at a temperature of 105° F. Cold compresses are applied to the head, and the body is gently rubbed.

Carbonic acid baths (artificial Nauheim baths) may be prepared by the addition of chemicals or specially prepared Triton salts to the water, but the evolution of the gas is somewhat uncertain and irregular. The gas may be generated by the action of bicarbonate of soda and hydrochloric acid in a porcelain-lined tub. The acid being diffused through the water after the soda has been dissolved. Another method has recently been placed on the market which is dependent upon the use of a specially constructed mat through which the gas is allowed to flow from a cylinder of the compressed gas. The flow of gas is greater, it is more evenly distributed through the bath and it can be regulated. It is certainly preferable to the older methods for home use if the baths are likely to be needed for a long period of time. The bath is given at 90° to 95° F. for five minutes and is followed

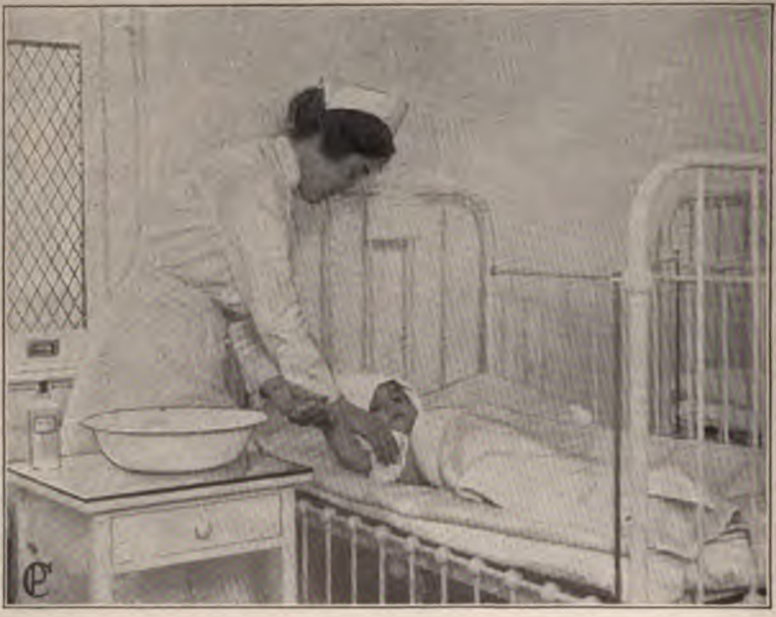


FIG. 22.— Method of giving alcohol sponge bath.

by gentle friction and rest in bed for several hours. These baths must be given at least three times a week for several months to produce permanently good effects. The baths are indicated in the convalescent stages of myocardial diseases.

The Nasopharyngeal Toilet.

The nasopharyngeal toilet, as advocated by Cáille, is a valuable prophylactic measure in diseases affecting or emanating from the respiratory tract, and is an effective adjunct in promoting a healthy condition of the nasopharyngeal mucuous membrane in many febrile diseases.

Method.— The method consists in slowly pouring into each nostril, by means of an ordinary teaspoon, a drachm of normal salt solution while the child lies with his head tilted back over a pillow and his mouth open. If gentleness is combined with tact when the measure is first attempted, the child soon learns that the method is not painful nor disagreeable. It can be used to advantage in such infectious diseases as diphtheria and scarlatina, and before and after operations upon the nose and throat, as in adenectomy and tonsillotomy and retropharyngeal abscess.

Lavage.

(*Stomach Washing.*)

This is a useful practice, but one which is often much abused. It is indicated as an initial procedure for persistent vomiting, especially in summer diarrhea, in cases of chronic gastrointestinal indigestion, acute gastritis, poisoning, in persistent vomiting, and preceding certain operative procedures as intestinal obstruction. Repeated stomach washing is to be deprecated. If the symptoms persist it is usually an indication that the dietary regulation is faulty.

The apparatus used is made with a soft-rubber catheter, No. 12 American, attached by means of a piece of glass tubing to another length of rubber tubing at the end of which is placed a small funnel. The catheter is introduced into the esophagus without any difficulty and with little discomfort to the infant. A warmed fluid, which may be either a normal saline solution, or contain bicarbonate of soda (a dram to the pint), or boric acid 2 per cent., is used in amounts depending upon the age and development of the child (see Chap. V). When the stomach is full this will be noted in the funnel, which is then depressed and the contents siphoned off. This process is repeated until the return flow is clear. The preferable method is to hold the child upright in the nurse's lap, the head being slightly inclined forward; if for any reason this is contraindicated the infant may be placed on its side, but this position requires more dexterity than the upright.

Enteroclysis.

Enterocylsis is a measure which can readily be used in infants and children. No special apparatus is required as in venous infusions or hypodermoclysis. In the latter, surgical cleanliness must be strictly observed, and it is difficult to carry out the technic, without trained assistants, outside of a hospital. Flushing the colon not only clears out the lower intestinal tract of deleterious material, but it stimulates renal secretion, thus promoting the excretion of toxic products. If there is high temperature this will be reduced and thirst assuaged. The absorption of the fluid increases the blood pressure, and by eliminating poisonous products indirectly assists in renewing the condition of the blood itself.

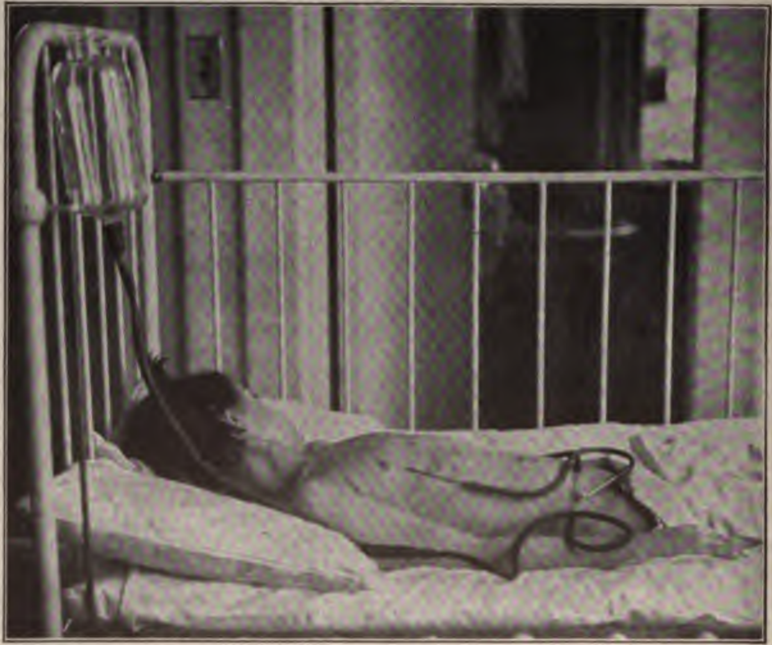


FIG. 23.— Illustrating technic for hypodermoclysis.

Method.— A soft-rubber rectal tube is attached to the end of a fountain bag into which has been poured a saline solution made by dissolving two teaspoonfuls of salt to two quarts of water at 110° F. The bag should be hung about three feet above the patient and the water allowed to flow slowly into the gut. If the intestine is irritable the pressure may be lowered so that the water will flow very slowly after the bowel has been emptied. Fluids will not usually penetrate beyond the ileocecal valve, but the entire intestinal tract will be stimulated to greater activity by the process.

In a series of radiographic studies of the colon and sigmoid flexure in the infant, Chapin showed there were remarkable variations both in form and situation. From these and other studies it has been proven that it is rarely, if ever, possible to pass the tube through the sigmoid flexure. In flushing the bowel it is only necessary to pass the tube through the sphincter and a few inches into the rectum. The fluid will then by reversed peristalsis reach the ileo-cecal valve. It is unnecessary and even harmful to try and pass the tube too far.

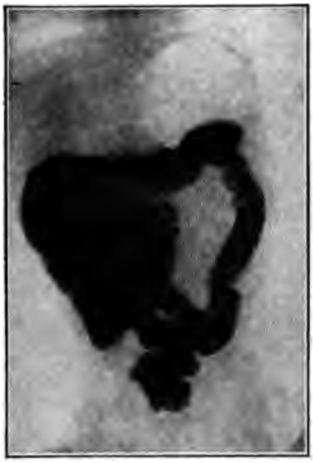


FIG. 24.— The large intestine of an infant, showing curve of sigmoid flexure.

In place of the saline solution it is often of advantage to use a bland soothing preparation, such as starch water, or, on the contrary, soap suds may be necessary if the intestine is inactive.

The **indications** for flushing or irrigation of the bowel are the removal of the putrescent material, as in enteritis and cholera infantum, and to assist elimination in the infectious diseases, such as typhoid and scarlet fever. It is also of distinct value in septic conditions and nephritis. In conjunction with baths it may also be used to reduce high temperatures, thus counteracting the harmful effects produced by the loss of fluids in the tissues. Once a day is usually sufficient. The mucous membrane is rendered irritable by too frequent irrigations.

Gavage.

Gavage, or forced feeding by the stomach-tube, is accomplished with practically the same kind of apparatus as that used for lavage, that is, a No. 12 American, soft-rubber catheter, a piece of tubing and an eight-ounce funnel, preferably of glass. The upright or the prone position, with the child lying on its back, may be selected. With infants no mouth-gag is required. In older children a mouth-gag, well protected by pieces or rubber to prevent laceration of the gums, will be necessary. Before introducing the food for the first time it is better to do a preliminary stomach washing. The food is allowed to flow slowly into the stomach, and when the desired amount has been introduced the catheter should be quickly withdrawn, the tube first being firmly pinched to prevent regurgitation and the entrance of any of its contents into the larynx. The infant should then be placed in bed and not disturbed, as in highly irritable conditions the food might be regurgitated.

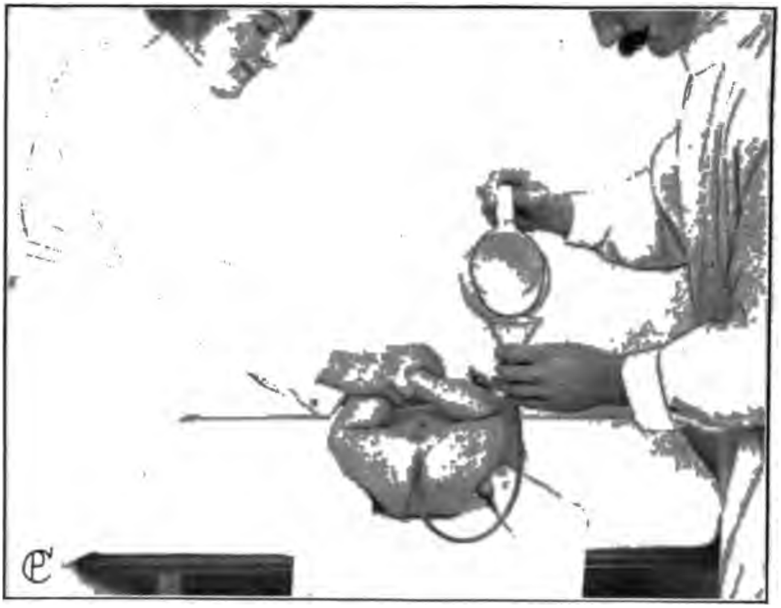


FIG. 25.— Enteroclysis: position of the patient for bowel irrigation.

The indications for gavage are the feeding of premature or asthenic infants who are unable to otherwise take their food, cases of habitual or obstinate vomiting in which the infants, as shown by Kerley, may vomit the food when swallowed, but retain it when given by the tube. Occasionally following intubation or operations on the esophagus, feeding by gavage is necessary. During meningitis or conditions in which there is coma, forced feeding may be indicated; as rectal feeding, except for a day or two, is of little value in early life.

The food used may be breast milk, full strength or diluted, modified or peptonized cow's milk, plain or dextrinized gruels. The amounts should be somewhat below the usual requirements and the periods of feeding lengthened. Care should be taken that the food is sufficiently warmed when it enters the stomach, as a luke-warm temperature is apt to induce vomiting.

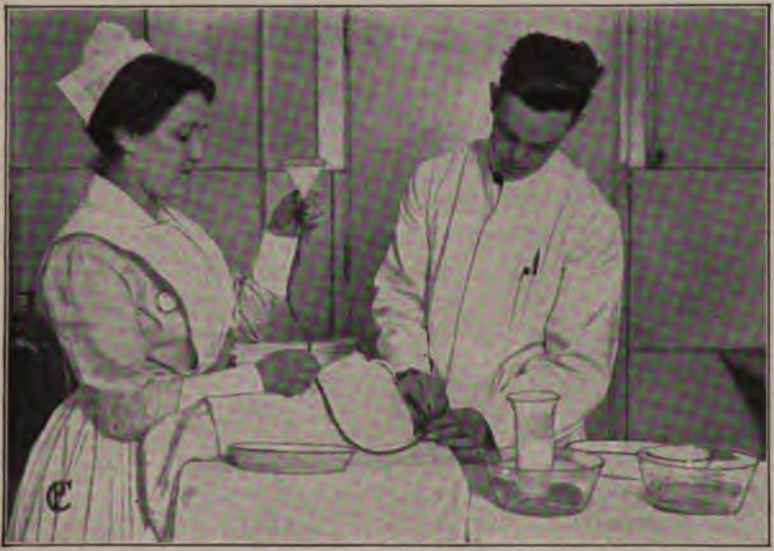


FIG. 26.— Position and apparatus for gavage.

Rectal Feeding — Nutrient Enemata.

Rectal feeding is rarely of service except for temporary use, as very little nutriment is absorbed. It may be possible to check body waste by this means, but we have never seen increase in weight when this was the only form of feeding. It is indicated in cases of cyclic or incessant vomiting or where there is an inability to swallow, in certain operative cases and when the food is not tolerated by the stomach.

Method.— The rectum should be cleansed with a bland enema, as saline solution, and an interval of at least a half-hour should be allowed before injecting the food into the rectum. The child is placed on his back or left side with the thighs well elevated. The prepared food is allowed to flow into the rectum from an ordinary fountain bag to the end of which has been attached a small-sized colon tube or large-sized catheter. If the anus and tube are well anointed with vaseline the tube may be advantageously passed well up into the colon. If this is slowly and gently done, peristalsis will not be excited, and the contents of the bag held just high enough to permit a flow will be more apt to be retained.

Infants will retain about two to six ounces, young children four to ten ounces. These enemata may be given three or four times in the twenty-four hours. Smaller amounts are always better tolerated and retained than larger quantities. When the rectal tube is withdrawn the buttocks should be pressed together, the child still retaining the recumbent posture. The fluids that may be used are peptonized or pancreatinized milk, eggs, albumin and gruels, or a combination of these. Occasionally stimulants or other drugs may be added to the food.

Vaccine Therapy.

The pathogenic action of any organism is almost entirely dependent upon the toxins which it produces. The most important feature of the bacterial toxins is its relation to immunity. An animal immunized to the action of a toxin is also protected against the pathogenic action of the bacterium which produces it. The toxins fall into two main groups: the extracellular soluble toxins (exotoxins) and the intracellular insoluble toxins (endotoxins).

The exotoxins are given off in a free state when the bacteria are grown in a suitable medium, and can easily be separated by means of a porcelain filter. They are not formed by all pathogenic bacteria. The most important examples of toxins belonging to the exotoxin group are the Bacillus diphtheriæ and Bacillus tetani; and it is in this group that the antitoxins are most easily developed and are most potent.

The group of the endotoxins is a much larger one, and it is with this type that a great deal of experimentation with the vaccines has been undertaken. The endotoxins are present in the bodies of bacteria, whether the latter have been killed by heat, by antiseptics, or by drying. This whole subject is further complicated by the fact that when bacteria are injected into a living animal they meet with resistance on the part of the host, and under these circumstances may produce protective substances which are toxic. This may in part account for the disappointing results which so frequently follow the use of a vaccine.

All individuals have a certain amount of natural resistance to infection, and the effort with vaccines is to increase this resistance. The protective substance which exists in the blood is called *opsonin,* and its function is the preparation of bacteria for ingestion by the leukocytes. During an infective process the amount of opsonin is below normal. Dead bacteria from a culture of the infective organism are injected into the infected individual for the purpose of increasing the opsonins to normal or above normal, and by thus rendering the blood rich in protective substance to hasten immunity. Immediately after injection resistance is on the whole lowered, and this is known as the *negative phase,* following which the resistance increases. In order to avoid giving a second injection during this negative phase Wright devised a method for measuring the opsonic power of the blood. This method is cumbersome, difficult and at best uncertain; and at the present time has been largely given up. In its place has been substituted a careful study of the clinical symptoms, and this method perhaps given sufficient indications for the timing of the dose. In any case it is probable that the importance of the so-called cumulative negative phase has been exaggerated. Still it must be confessed that there is very little agreement among those who are using vaccines as regards either the size or the spacing of the dose.

The preparation of a vaccine is comparatively simple. The organism to be used is grown in pure culture. The culture is taken up in physiological salt solution, which is shaken until evenly distributed, after which it is standardized so that each c.c. contains a definite number of bacteria. These bacteria are then killed by heating to 60° C. for one-half hour, and 0.5 per cent. of carbolic acid is added as a preservative.

In children a smaller dose is given than to adults, and as usual this is based on age. The dose varies, however, according to the organism injected. It might be added that larger doses are rarely followed by disturbing symptoms, and there are indications that the present dosage of vaccines is too small.

Unfortunately the statistics as regards vaccines are not very reliable. The occasional brilliant result in an isolated case may be due to the part nature plays in affecting a spontaneous cure, while on the other hand where no results are obtained there is nothing to publish. Also it is certain that overzealousness in trying a new remedy has frequently eclipsed the better judgment of the observer.

Scarlet Fever.— In scarlet fever the Russians have apparently achieved remarkable results by preventive inoculations with a vaccine made from a bouillon culture of streptococcus isolated from a person ill with scarlet fever, and killed by heating to 60° C. These vaccines were used in

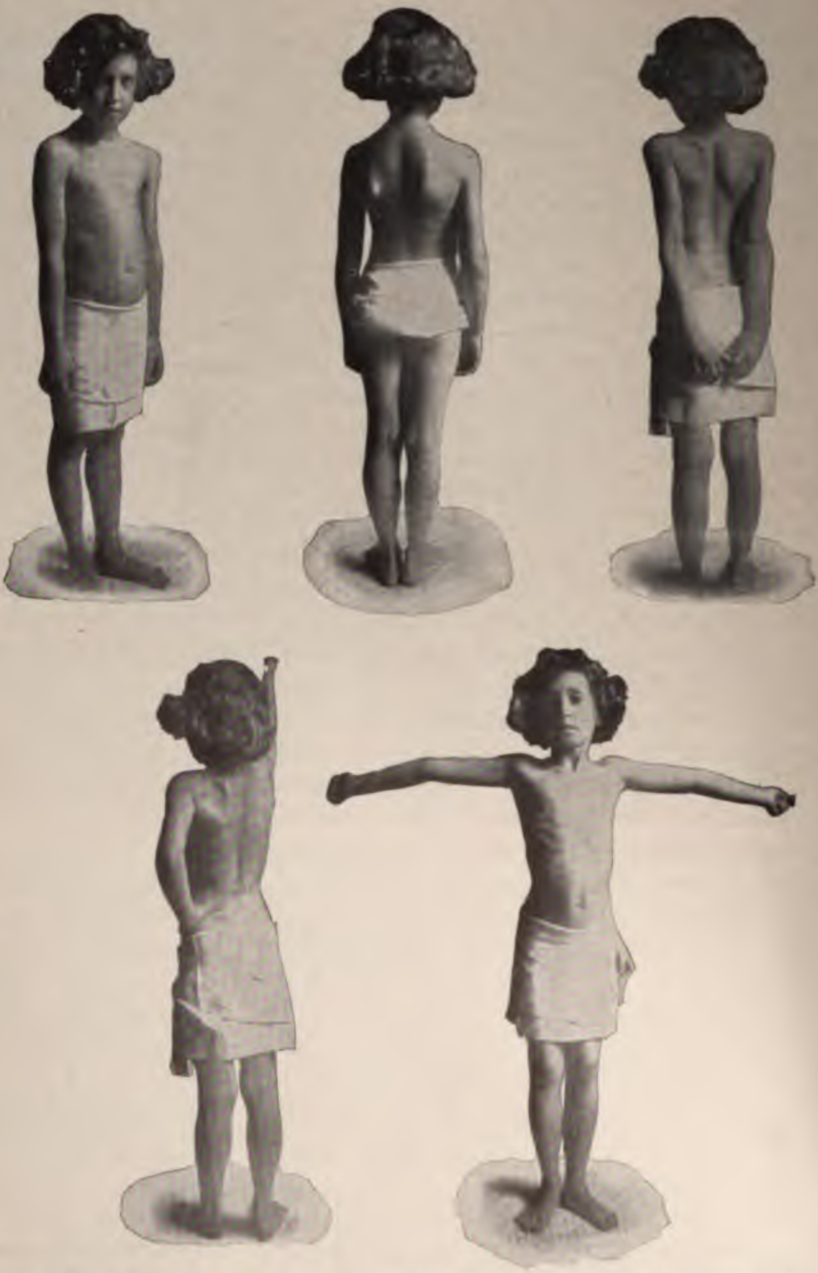


FIG. 27.— Exercises for developing children: (a) narrow flat chest in a mouth breather; (b) showing winged scapulæ and curvature; (c) and (d) corrective exercises.

Russian villages in scarlet fever epidemics in which from 15 to 57 per cent. of the uninoculated were stricken with the disease. Of those who had received three injections of the vaccine none were affected; of 2,034 who had received two or more vaccinations, only two were attacked; of 2,737 others who had received only one injection of the vaccine, forty-one were attacked. Most of those cases who had received vaccine treatment ran an exceedingly mild course. The immunity following three injections is supposed to last about one and one-half years.

These figures are not only important from a prophylactic standpoint, but also serve as a strong indication of the etiological cause of scarlet fever.

Typhoid Fever.— Available statistics indicate that prophylactic vaccination against typhoid is an invaluable measure. The duration of the immunity conferred is not as yet determined, but it is probably about three years. The reaction to this vaccination is only occasionally quite severe; there being malaise, fever and soreness at the point of injection.

As regards vaccination during the course of the fever itself there is a great difference of opinion, the consensus of opinion being that it is of no value. However, there is reason to think that the dose has been much too small and perhaps the results would have been better if 200,000,000 or 300,000,000 had been used instead of the usual dosage of 30,000,000 or 50,000,000.

Septicemia and Septicopyemia.— Its treatment with autogenous vaccines has seemingly been of value in some cases. Certainly a blood culture should be made in all of these cases and the effects of a vaccine tried.

Pneumonia.— As pneumonia is a self-limiting disease it is difficult to draw any conclusions as to the value of the vaccine treatment. Little or no attempt has been made to treat children in this manner. There are several reasons for this, the chief of which is the varied infective agent of the pneumonia, which entails the considerable delay of making an autogenous vaccine for each case.

Acute Ulcerative Endocarditis.— If a positive blood culture is obtained benefit may be hoped for by the use of an autogenous vaccine. About one-third of the cases will show no improvement. Out of six cases treated by Wright two were cured, one improved and three were not affected one way or the other.

Adenitis.— The cases of acute adenitis are too few to allow of any conclusions.

In tuberculous adenitis the tuberculin treatment seems to be of some value. This is especially true if treatment is begun before the gland begins to break down.

Pyelitis and Cystitis.— The result of treatment with vaccines in both of these conditions is very good, particularly in colon b. types. The improvement usually begins promptly, the frequent urination, pain, etc., disappearing quickly. It is, however, practically impossible to cause a total disappearance of the pus and bacilli.

Vaginitis (Specific).— Hamilton recently published some very gratifying figures as regards the treatment of vaginitis in children, the only difficulty being that no one has been able to duplicate them. In other hands the vaccine treatment in this condition has proven valueless, or nearly so.

Furunculosis.— The vaccines are of benefit in this condition. No other method of treatment will give such satisfactory results, although it must be born in mind that for some unknown reason a small percentage of cases will not react.

Acne.— Vaccines will cure a large percentage of these cases when the acne bacillus can be isolated. In nearly every other case there will be some improvement, but here and there a case will be met with in which the vaccine will exert no apparent influence.

Mastoiditis and Otitis Media.— When other means fail a vaccine may be tried. There is much difference of opinion as to whether they are of any value, the consensus of opinion apparently being that they do little good.

Nearly all those who have worked with vaccines disagree as to the dosage. It would be a distinct advantage if there could be some uniformity of dosage, but in examining the literature it is found that one man is treating furunculosis with 10,000,000 dead staphylococci while another gives a dose of 1,500,000,000. Naturally the question arises as to whether the dose which the one man gives is not so large as to actually do harm while that given by the other is much too small to be effective. There is the same disagreement as regards the spacing of the dose, some giving it every day and others every two weeks. For these reasons the following table based on work done under our direction is given as a tentative one:

Organism	Dose	Interval between doses
Staphylococcus	250-1,000 million	Three to seven days.
Streptococcus	25 million	Daily.
	100 million	Every fifth day.
Pneumococcus	50-250 million	Two to five days.
	(infant 10 million)	In pneumonia smaller doses at more frequent intervals should be used daily.
Gonococcus	Acute. 5-50 millions	Every five days.
	Chronic 50-500 million	
Typhoid bacilli	Immunity. 750-2,000 million	In three doses at ten days interval.
	Treatment. 100-250 million	Every other day.
Bacillus coli	10-50 million	Three to twelve days.

Stock vaccines may be used if the diagnosis is established, until such a time as is necessary to prepare an autogenous vaccine. It should be born in mind, however, that they are not as satisfactory as those prepared directly from cultures of the infecting organism.

Breathing and Resistant Exercises.

While special physical training is important and often opportune in the cure of deformities and badly-developed children, a greater proportion of all children need some systematic training in the act of correct breathing and instruction as to correct posture.

The schools in some of the larger cities are making some valuable efforts along these lines, through physical directors who have made a study of life during the developmental stage. At this time good habits are easily inculcated; later, in adult life, they are brought about only with difficulty and the expenditure of valuable time.

If breathing as an art is taught the child, it will develop its lung capacity and supply the proper amount of oxygen to the growing tissues. Each breath should be taken in slowly through the nostrils in as large a quantity as is comfortable without effort; gradually this amount is increased as the natural elasticity of the lungs is increased, and in a short time, with thought and practice, diaphragmatic breathing becomes the natural breathing of the child.

In the Logi method, the patient lies on the floor upon a sheet, with windows wide open and clothing perfectly free. One nostril is closed and an inhalation taken and held a few seconds before exhaling through the opposite nostril, and this is repeated several times with frequent pauses for rest and diversion.

The next step is the development of intercostal breathing; later the accessory breathing muscles are utilized, and finally the so-called complete breathing is perfected. The best results are obtained when individual instruction is given by a competent teacher.

The parents may later act as monitors and encourage the children to go through their exercises daily. As a rule, the little patients delight in this, and consider it a pleasure rather than a task. By continuing slow, resistant exercises with the deep diaphragmatic breathing, placing the pupil before a mirror and teaching him to concentrate his mind upon each movement, the general tone of the body can be markedly raised. Three times a week for fifteen-minute periods usually suffices in the beginning.

The aim should be not to produce great muscular development, but simply to create a natural demand for proper food, improve the general circulation, and bring about better health.

The indications for these exercises are many, but the best results are obtained in children who are shallow mouth-breathers as a result of various disorders of the respiratory tract or of nutrition. We have had excellent results with this method following adenoid operations, and in rachitic and anemic children with perverted appetites. Neurotic children also react very favorably.

CHAPTER X.

SUGGESTIVE SCHEME FOR DIAGNOSIS.

To confirm the suggestions for diagnosis in this table the reader can refer to the section that treats at length of the disease mentioned.

Head.

Size.

(*a*) Small — Microcephalus, idiocy.
(*b*) Large — Hydrocephalus, rickets, hypertrophia cerebri.

Shape.

(*a*) Square — Rickets. (Prominent frontal eminences.)
(*b*) Asymmetrical — Rickets, cretinism, idiocy, brain tumors, atrophy of brain.
(*c*) Bulging Forehead — Hydrocephalus.
(*d*) Prominent Frontal and Parietal Bones — Syphilis.
(*e*) Craniotabes — Syphilis, rickets, chondrodystrophy.
(*f*) Open Sutures — Rickets, hydrocephalus, cretinism, idiocy.

Position.

(*a*) Retraction — Meningitis, Pott's disease.
(*b*) Lateral Deviation — Wry neck, rheumatic torticollis, Pott's disease, injury to neck muscles at birth, abscess. (Peritonsilar, postpharyngeal or of cervical glands.) Middle ear or mastoid, hematoma, sternomastoid, curvature, hysteria.

Motion.

(*a*) Purposeless Movements — Chorea, tics.
(*b*) Rythmic — Nodding spasm.
(*c*) Flaccidity — Anterior poliomyelitis, coma, late meningitis.

Fontanel. (Normally open till eighteenth month.)

(*a*) Bulging (during cry normal) — Hydrocephalus, meningitis, hemorrhages within, brain tumor, thrombosis of sinus.
(*b*) Depressed — Atrophic constitutional diseases, severe diarrhea, first stages of meningitis.

Tumors. (About the head.) Hematoma, abscess, sarcoma, syphilis, encephalocele, hydromeningocele, hernia cerebri.

Neck.

Tumors. (About the neck.)

(*a*) Parotitis.
(*b*) Lymph node hypertrophy.
(*c*) Thyroid enlargement.
(*d*) Branchial cleft.
(*e*) Congenital cysts (blood cysts, angiomata, hygroma).
(*f*) Hematoma (especially of the sternomastoid).

Face.

Expression.

(*a*) Pain (intermittent) — Colic, dentition, dysuria, otitis, bodily discomfort.
(*b*) Pain (continuous) — Pneumonia, pleurisy, peritonitis.
(*c*) Pain (on handling) — Scurvy, fracture, dislocation, rickets, spinal paralysis, meningitis, neuritis, rheumatism.
(*d*) Anxious — Obstructed breathing or dyspnea from any cause; heart disease.
(*e*) Cretinoid — (Thick lips, protruding tongue, stolid).
(*f*) Sad — (spirituelle). Tuberculosis and chronic diseases.
(*g*) Disgust — Dyspepsia, gastritis, abdominal disease.
(*h*) Senile — Marasmus, syphilis, internal hydrocephalus.
(*i*) Pinched (abdominal) — Peritonitis, cholera infantum, prolonged or severe diarrhea, collapse.
(*j*) Foolish — Idiocy.
(*k*) Stupid (fish mouth) — Adenoids.

Mouth.

Open Mouth.

Cretinism, rickets, idiocy, coryza, inflammation of the throat.

Lips.

Enlarged.— Cretinism, syphilis, adenoids and hypertrophied tonsils, infection, neoplasms.

Fissures and Ulcerations.

Syphilis, stomatitis, after and during acute infectious diseases, injuries.

Tongue.

Enlarged.— Congenital, cretinism, idiocy, inflammatory processes, trauma, infection.

Fissures and Ulcers.— Syphilis, caries of the teeth, tuberculosis, stomatitis, ulcer of frenum.

Enlarged Papillæ.— Strawberry tongue of scarlet fever, diabetes, lymphatic leukemia, status lymphaticus.

Geographical.— Intestinal fermentation, tuberculosis.

Gums.

Swollen, Bleeding or Spongy.— Gingivitis, acute infectious diseases, scurvy, congenital heart disease, leukemia, stomatitis, difficult dentition, caries of the teeth, neoplasms.

Teeth.

Syphilis (Hutchinson's teeth), cretinism (small pointed), severe chronic diseases (notches, ridges, rings). Delayed dentition; rickets, syphilis (in infancy). Chronic diseases of infancy — Loosening and shedding in scurvy, mercury, caries.

Swallowing.

(*a*) **Pseudodysphagia.**

Nasal obstruction, sore mouth, parotitis, adenoids, pyloric stenosis, anorexia.

(*b*) **True Dysphagia.**

Paralysis of soft palate, pharynx or tongue.

Spasm of muscles in tetanus, chorea, strychnin poisoning, hysteria, Thomsen's disease.

Swellings of tonsils. Peritonsillar abscess. Angina, mediastinal glands, thyroid, thymus.

Macroglossia.— Cretinism.

Corrosion. Cicatrix. Heat, drugs, syphilis, tuberculosis, trauma, ulcer, foreign body.

Congenital Defects.— Atresia, stenosis, diverticula.

Abnormalities in Breathing.

Mouth Breathing in Nasal Obstruction.

(Noisy breathing, snoring) narrowing or obliteration, congenital obstruction, cretinism, syphilis, deformities, chondrodystrophy, adenoids, polypus, foreign bodies, hematoma, tuberculosis, lupus, abscess, rhinitis acute and chronic, injuries.

Inspiratory Dyspnea.

(*a*) *Pharyngeal Stenosis.*— Enlarged tonsils, chronic neoplasms, retropharyngeal and peritonsilar abscess. Diphtheria, cold abscess, tuberculous glands, vertebral caries, macroglossia, ranula, neoplasms of tongue and jaw.

(*b*) *Laryngeal Stenosis.*— Diphtheria, spasmodic laryngitis (croup), laryngo-spasm with crowing inspiration, tetany, rickets, hydrocephalus, enlarged bronchial glands, status lymphaticus, membrane in scarlet and measles, tuberculosis, syphilis, neoplasms, urticaria, foreign bodies, drugs, scalding, corrosion, edema glottis, edema from renal and cardiac disease, goiter, paralysis.

(*c*) *Tracheal and Bronchial Stenosis.*— Diphtheria, enlarged bronchial glands, thymic disease, goiter.

Expiratory Dyspnea.

Emphysema, asthma, spasm of inspiratory muscles, tetanus, tetany, epilepsy, hysteria, convulsions (irritation phrenic nerve in pericardial effusion).

Mixed Dyspnea.

Bronchitis, pneumonia, pulmonary edema, pleurisy, tuberculosis, heart disease, the anemias, toxic and acute infectious diseases, diabetic coma, uremia, gas poisoning, heat stroke, organic lesions of pons and medulla, tumors, abscess and hemorrhages of brain, anterior poliomyelitis with cerebral symptoms.

Chest.

Shape.

(*a*) *Barrel Shape.*— Emphysema, pertussis, asthma, bronchiectasis, chronic bronchitis, pneumothorax.

(*b*) *Contracted Chest.*— Rickets, tuberculosis, stenosis of upper respiratory tract as adenoids and stenosis of larynx.

(*c*) *Bulging Sternum* (pigeon breast).— Rickets, heart disease, pertussis, stenosis alone.

(*d*) *Asymmetrical.*— Pleural effusions, pneumothorax, pleural adhesions, scoliosis.

(*e*) *Funnel Shape.*— Rickets, intraabdominal pressure.

(*f*) *Harrison's Groove.*— Rickets.

Tumors of Chest Wall.

(*a*) Pointing empyema, caries of spine, bronchial glands, periostitis.

(*b*) *Breast* — (Milk distention, septic mastitis, mumps, true tumors.)

(*c*) Bulging precordia, heart disease, pericarditis.

(*d*) Hernia of lung.

Abdomen.

General Enlargement or Prominent Abdomen.

(*a*) *Distention with Gas.*— Dyspepsia, gastritis, pyloric stenosis, intestinal indigestion and dysentery, intestinal obstruction, constipation, tuberculosis and septic peritonitis, pneumonia, typhoid, congenital dilatation of colon, obstructed hernia, intestinal perforation.

(*b*) *Fluid.* (1) Peritonitis (chronic, serofibrinous, tuberculous, septic (from umbilicus), gonorrheal, pneumonic.
  (2) Heart disease (uncompensated heart and chronic adhesive pericarditis).
  (3) Kidney diseases.
  (4) Hepatic diseases (cirrhosis, true tumors, degeneration).
  (5) Portal obstruction (enlarged glands, adhesions).
  (6) Grave anemias.

(*c*) *Constitutional Diseases.*— (Usually from weak spine.) Rickets, cretinism, syphilis, marasmus.

(*d*) *Miscellaneous.*— Pott's disease, curvature, congenital dislocation of hip. Hysteria.

(*e*) *Enlarged liver and spleen.*

Enlarged Liver.

(1) *Hyperemia in Sepsis.*— Cardiac and pulmonary affections.
(2) *Toxic.*— (*a*) Alcohol, phosphorus, santonin.
  (*b*) Acute infectious diseases.
(3) *Constitutional Diseases.*— Tuberculosis, syphilis, rickets, athrepsia.
(4) *Cirrhosis.*— (Acute yellow atrophy.)
(5) *The Anemias.*— Leukemia, pseudoleukemia, splenic anemia, Banti's disease, primary splenomegaly.
(6) Abscess, cysts and true tumors.

Enlarged Spleen.

(1) Acute infectious diseases.
(2) Constitutional diseases (as above).
(3) Hepatic, cardiac and pulmonary (as above).
(4) The anemias (as above).
(5) Abscess, cysts and neoplasms.

Localized Tumors.

(*a*) *Kidney.*— Floating kidney, hydronephrosis, pyelitis, perinephritis, neoplasm, cystic kidney, tuberculosis.

(*b*) *Stomach and Intestines.*— Pyloric stenosis, intussusception, appendicitis, impacted feces, worms, neoplasms, congenital dilatation of colon.

(*c*) *Miscellaneous.*— Thickened omentum (tuberculous peritonitis), mesenteric glands, psoas abscess, encysted peritoneal abscess, distended bladder.

Tumors of Abdominal Wall.

Abscess, hematoma, hernia (muscular).

Umbilical Region.

(1) Hernia (of omentum, intestines, bladder).
(2) Fungus (granulations).
(3) Periumbilical abscess.

Inguinal Region.

Tumors or Enlargements.

Hernia, hydrocele of tunica vaginalis and cord.
Undescended testicle.
Orchitis, mumps, syphilis, tuberculosis, influenza, trauma.
Neoplasms.
Varicocele.

Delayed Growth.

(*a*) Improper feeding and digestion, starvation, pyloric stenosis, marasmus.
(*b*) Cretinism, rachitis, idiocy, infantilism, osteomalacia, micromelia.
(*c*) Tuberculosis.
(*d*) Syphilis.
(*e*) Valvular heart disease.
(*f*) Progressive paralysis.

Hemorrhages.

1. General Causes.

(1) *Acute Infectious Diseases.*— Pyemia, septicemia.
(2) *Toxic.*— Iodids, mercury, ergot, belladonna, phosphorus, antipyrin, chloral, arsenic, food poisoning, snake bites.
(3) *Constitutional Diseases.*— Syphilis, scurvy, Bright's disease, tuberculosis, athrepsia, cachexia.
(4) *Purpura.*— Purpura simplex, fulminans, hemorrhagica rheumatica, Henoch's purpura.

(5) *Blood Diseases.*— Hemophilia, leukemia, pseudoleukemia, splenic anemia. Banti's disease, severe secondary and pernicious anemia.

(6) *Mechanical.*— Injury, pertussis, epilepsy, at birth.

2. Special Causes.

(*a*) *Of New-born.*— Asphyxia, obstetrical operations, deficient expansion of lungs, sepsis, syphilis, hemophilia, congenital disease of liver and bile ducts.

(*b*) *From Nose.*—

(1) *In new-born as above.*

(2) Affections of mucous membrane. Traumatism, foreign body, acute and chronic rhinitis, adenoids, polypus, diphtheria, measles, worms.

(3) Congestion, prolonged cough. Cardiac and pulmonary affections. Overheating, nephritis, sinus thrombosis.

(4) Prodromal, in acute infectious diseases.

(5) Vicarious menstruation.

(6) Fractured skull.

(*c*) *Of Stomach.*— Gastric ulcer, chemical erosions, worms, foreign body. Occlusion of intestines, swallowed blood, general causes as in 1.

(*d*) *Rectum.*— General causes and new-born. Severe enteritis, gastric and intestinal ulcer, follicular and membranous enteritis, worms, intussusception and strangulation, hemorrhoids, polypus, anal fissure, condyloma, prolapse rectum, injury with enemata, etc., typhoid, tuberculosis.

Extremities.

1. Disturbances of Motion.

(*a*) *Paralysis or Pseudoparalysis.*— Anterior poliomyelitis, scurvy, syphilis, rickets, postdiphtheria, cerebral palsy, neuritis, birth palsy, meningitis, fracture, epiphyseal suppuration, osteomyelitis, spina bifida, transverse myelitis, progressive muscular atrophy. Landry's paralysis.

(*b*) *Inability to Walk or Walk with Limp.*— (Any of the above paralyses cited in (*a*)). Delayed walking. Tuberculosis of the hip, knee, ankle, Pott's disease, osteomalacia, congenital dislocation of the hip, rickets, coxa vara, rheumatism, mental deficiency, idiocy, hydrocephalus and microcephalus, cretinism, weakness after disease or poor nutrition, progressive muscular atrophy, flat-foot, improperly fitted shoes.

(*c*) *Spastic Extremities* (*rigidity*).— (Normal in early infancy.) Gummata, cerebral hemorrhages, sclerosis, tumors, spastic paraplegia, acute encephalitis, Little's disease, hydrocephalus, meningitis, lateral sclerosis, hereditary ataxia, tetany, catalepsy, tetanus.

2. Swellings.

(*a*) *Joints.*— Chronic and acute polyarthritis. (Rheumatic, purulent, gonorrheic, following scarlet fever and pneumonia). Tuberculosis of the joints, simple effusion, bursitis.

(*b*) *Bones.*— Rickets (epiphyseal), syphilis, scurvy (subperiosteal). Osteomyelitis, neoplasms.

(*c*) *General Enlargement.*— Anasarca, angioneurotic edema, sepsis, hydremia, acromegaly, elephantiasis, erysipelas, cretinism.

3. Hands.

(*a*) *Dactylitis.*— (Simple, tuberculous, syphilitic.)

(*b*) *Clubbed Fingers.*— Heart disease, chronic cough, hepatic cirrhosis.

(*c*) *Claw Hand.*— Ulna paralysis, progressive atrophy, lesions spinal cord, ischemic paralysis.

(*d*) *Purposeless Involuntary Movements.*— Chorea (infectious and hereditary, Huntington's). Organic brain lesions (hemiplegia, tumors, abscess brain, sclerosis after meningitis). Friedrich's ataxia, habit spasm, idiocy, hysteria.

SECTION IV.

INFANT FEEDING.

CHAPTER XI.

THE INFANT FROM THE NUTRITIONAL STANDPOINT.*

Introduction.

The general practitioner is expected to look after the nutritional wants of infants. With the average normal baby he can succeed, provided he is grounded in the principles of nutrition. In the succeeding chapters infant feeding will be outlined in such a way as to enable the physician to apply the principles involved in the management of all infants. It is unwise to read or study any one section, without noting its relation to the entire subject.

Infant feeding is perhaps the most difficult of the pediatrician's problems, and the general practitioner must realize the need of a careful study of this subject.

The Infant.— The problem of nutrition begins when the fertilized ovum starts to divide and form additional cells, and from this time on until death there is an unceasing demand for food. During a life history the food is supplied in many different forms, and as the organs of nutrition change in the earlier stages of development, the physical properties of the food change also. In the earliest stages the food is supplied from the yolk of the ovum; as development progresses, the villi of the chorion appear and act as organs of nutrition; these gradually merge into the placenta, which derives food from the maternal blood; at birth the breasts supply food in the form of colostrum for a few days, which is gradually displaced by milk. When the milk supply naturally fails, toward the end of the first year, the child is capable of digesting some forms of semisolid food such as its parents eat, and continues its development on this food.

Essential Unity of Foods.— When all forms of food, including mother's milk, are subjected to chemical analysis they are found to be composed of ingredients which fall into five groups: Proteins, oftentimes termed proteids, which form the tissues; mineral matter which is necessary for bone formation, and also in lesser quantities to replace metabolic waste; fats and carbohydrates which supply the energy; and water. *The great difference in foods at different ages is not one of composition, but of form.*

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* For greater details in reference to the biology of this subject, see "Theory and Practice of Infant Feeding," by Dr. H. D. Chapin. Third edition. William Wood & Co.

Foods of the First Nutritive Period.— The mother supplies food to her offspring in six different forms: First, the yolk of the ovum; next the fluid in which the ovum is bathed; then that which is supplied in a form suited for assimilation by the chorion; and then by blood which circulates through the placenta. When birth occurs, the food is supplied through the breasts in two forms, at first colostrum and finally as milk.

Each of these forms of food is specially adapted to the infant at the time it is furnished, and as soon as the infant outgrows one form of food another is supplied.

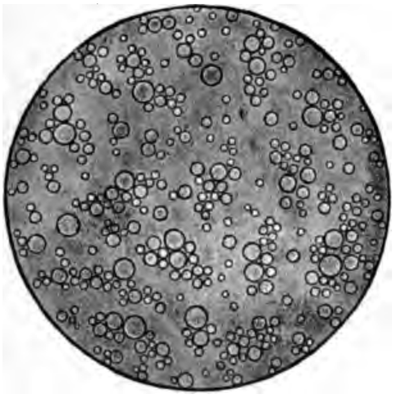

FIG. 28.— Normal human milk. (*Jewett.*)

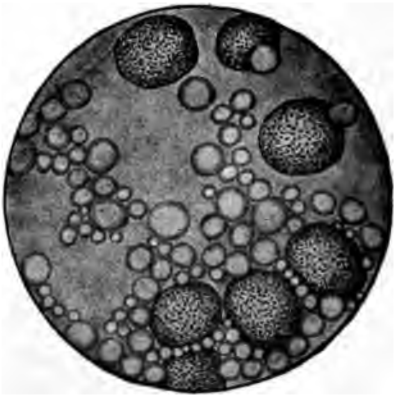

FIG. 29.— Colostrum corpuscles. (*Jewett.*)

Breast Secretions: Specialized Foods.— It is plain that before birth the form of the food supplied by the mother and the method of furnishing it change to suit the state of development of the fetus; and as at birth the digestive organs of the infant are not fully developed, it may be concluded that in some way the breast secretions are peculiarly adapted for that part of the first nutritive period in which the digestive tract is developing.

Composition and Properties of Breast Secretions.— The first secretion of the breasts or mammary glands after the infant or young animal is born is called *colostrum*. Chemical analysis shows it to be composed, like all foods, of proteins, mineral matter, fats, carbohydrates, and water.

Upon boiling, colostrum coagulates, owing to a large portion of the protein being in the form of albumin. It is also distinguished by the presence of colostrum corpuscles (Fig. 29). In the course of a few days after birth the character of the breast secretion undergoes a complete and radical change. The later secretion is milk, which is also composed of protein, mineral matter, fats, carbohydrates, and water, but it will not coagulate when boiled, showing there has been a change in the character of the protein, and the colostrum corpuscles are absent. From these facts it is evident that chemical analysis throws little light on the properties of either colostrum or milk, except to show that they are composed of the basic food elements.

As the characteristic feature of nutrition during the first nutritive period is the adaptation of the form of the food by the mother to the organs of nutrition of the fetus, which are constantly undergoing change, it is evident that the way to acquire a knowledge of the properties of the breast secretions is to study them in relation to the infant's digestive organs.

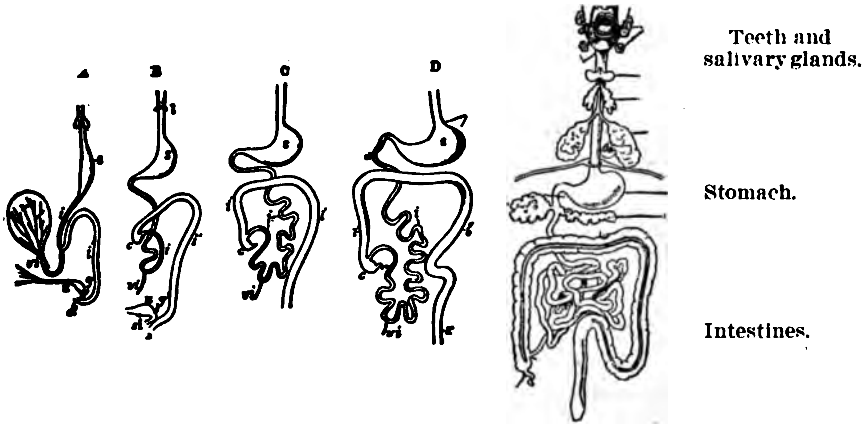

FIG. 30.— Development of human digestive tract. (*Allen Thompson and Wiedersheim.*)

Development of the Digestive Tract.— At birth the digestive organs are quite different both anatomically and physiologically from those of the adult. Teeth are absent, which in the adult reduce the food to a state of fine subdivision, to fit it for the stomach, and the gastric secretions particularly are not like those of the adult, and in some animals the stomach is not fully formed. During the colostrum period there is little gastric secretion, but when the mother secretes milk, the rennet ferment or rennin, which is closely allied to pepsin, is secreted in the stomach. Rennin prepares the milk for stomach digestion by the infant in much the same manner as teeth prepare the food for digestion later in life. That is, rennin acts upon a portion of the milk and changes it from a fluid into a semisolid which has on a small scale much of the physical property and texture of the chewed food of the adult. Until pepsin and acid are secreted, true gastric digestion does not take place and the solid remains very soft; but when acid appears it in some way combines with the solidified milk, rendering it more solid and fitting it for digestion by pepsin. Thus it is that the first solid food for the undeveloped digestive organs is produced from the specialized food supplied by the mother, and its digestive properties are altered or adapted to the stomach by the gastric secretions.

Comparative Mammary Secretions.— As far as known, all mammals secrete colostrum for a few days after birth takes place, and this secretion is followed gradually by milk, but the milks of different species show wide differences in their properties. When they are subjected to chemical analysis, it is found they all agree in being composed of proteins, mineral matter, fats, carbohydrates and water, although the proportions of these ingredients are not the same in all kinds of milk or in the milk of different individuals of the same species. It might appear from this that the differences between milks of different species were due merely to the varying proportions of the food elements present, but when it was known how little idea of the properties of a food is shown by the report of its chemical analysis, the limited value of food analyses in infant feeding was appreciated.

However, it must not be supposed that a chemical analysis of food or milk has no value, but its true value should be recognized and not overestimated.

The proper way to compare milks for infant feeding is to see how they react to rennin, pepsin, and acid, and how they compare in composition. Milks of different species show great differences, although they may have identically the same composition; that is, be composed of the same quantities of proteins, mineral matter, fats, carbohydrates, and water. Human milk is changed into a semisolid, finely divided mass by rennin, pepsin and acid; cow's, goat's, and sheep's milk into a solid mass which is of the same volume as the milk; mare's and asses' milk into a fluid jelly. This results from the action of rennin on a portion of the protein generically termed casein, or by some caseinogen. When the digestive organs of various animals are compared, they are found to differ in form or in their physiological action. Mother's milk is digested in much the same manner as the food will be after weaning has taken place. In other words, nature demands that the food should be adapted to the species.

Animals that grow rapidly need larger quantities of proteins than those which grow more slowly and the mothers of animals whose growth is rapid secrete milk much richer in proteins than mothers of animals whose growth is slower.

In practical feeding it is found that milks of different species are not interchangeable from a digestive standpoint, although they are all highly nutritive, but the reason was not discovered until infant feeding was studied from the standpoint of milk as a specially adapted food, and the subject was considered from a biological standpoint.

Chemical and Biological Standards in Infant Feeding.—There have been used from time to time various methods of making cow's milk agree with infants, such as adding lime-water, bicarbonate of sodium, citrate of sodium, and peptonizing materials, which have produced chemical changes, each of which has been claimed to make cow's milk like human milk. These methods have been confusing and contradictory and have made the whole subject chaotic. The aim has been to make human milk by chemical means and the standards used in feeding until recently have been purely chemical. But as the effects of the different methods in practice have been studied it has been found that they do not make human milk, but either change the character of the proteins of cow's milk, or alter the action of the digestive secretions of the infant on the milk, so in reality while the theory has been that chemical changes were utilized to make human milk of cow's milk, practice has been along the line of adapting food to the infant. Theory and practice have been diametrically opposed and naturally great confusion was the result.

Since the recognition of the fact that it is impossible to make human milk from other substances as yet, and that the practice is to adapt food to the infant, the biological standard of feeding has assumed greater importance and makes theory and practice coincide.

This standard or principle may be stated as follows:

At all stages of life the food must be composed of proteins, mineral matter, fats, carbohydrates, and water.

These elements exist in a great variety of forms which are equally nutritious, but are not equally adapted for the digestive organs at all ages, or for all species of animals, as their digestive organs are not alike.

The peculiarities of the digestive organs must be first considered, and after this has been done food must be selected that is adapted for the particular digestive tract.

After such a food has been found its composition must be looked after so that enough of the elements necessary to produce proper growth and development may be assured.

In the treatment of practical feeding this plan will be followed, and the prominent position heretofore given to the supposed chemical differences between human milk and other foods will not be found in this work. The chemical side of feeding will be subordinated to the physiological aspect, for in practice all that the chemical composition of a food shows is its *possible* nutritive value, its *actual* value for each infant being a subject for determination by experiment with the infant.

Recapitulation.— The main points to be kept in mind in infant-feeding are:

The mother's breast secretions are specialized forms of food, adapted to the developing digestive organs.

Milks of lower animals and table food are as nutritious as mother's milk, but are not adapted to the undeveloped condition of the infant's digestive tract.

The chemical composition of a food shows nothing concerning its suitability for any animal and is not of first importance.

The value of foods for individuals cannot be judged by comparing their chemical composition alone.

Foods may be "chemically right but practically wrong."

The food *elements* required by all infants are the same, but the *form* in which they are to be presented must be determined for each infant.

CHAPTER XII

BREAST-FEEDING.

Importance of Breast-feeding.— The breast secretions are furnished during the time the infant's digestive apparatus is developing, and serve a purpose in addition to supplying nourishment. The secretions of the breasts adapt themselves to the increasing strength of the digestive organs, and, instead of these organs finding their work easier as they become stronger, they find the digestive work increases as their digestive capacity becomes greater. This is brought about by an alteration in the physical properties of the mother's milk in the stomach by the infant's gastric secretions before true digestion commences. The rennin, pepsin and acid of the stomach, as they successively appear, produce profound changes in the physical condition of the milk. When rennin acts alone, as it does in very early infancy, the milk becomes a fluid jelly; but later on when pepsin and acid appear the milk is changed into a mass having much of the consistency of well-chewed food, and which should be looked upon as its prototype. It is thus that the digestive organs are prepared to digest semisolid food about the twelfth month, when weaning naturally takes place. In addition to this interesting and important property of the mother's milk, it generally contains the food elements in the proportions and forms best suited for proper nutrition of the infant.

It is not a difficult matter to bring together the food elements in the same quantities as are found in any specimen of breast milk, or colostrum, but even when derived from milk of lower animals the food does not have the delicate properties of the breast secretions, and it is often contaminated or has undergone bacterial changes.

While many infants are successfully fed on substitutes for breast secretions, such feeding should not be attempted until every effort to secure breast-feeding has failed.

The death rate is much higher among artificially fed infants than among those breast-fed, and in hot weather when bacterial changes in the food are greatest the loss of artificially fed infants is several times greater than during the colder seasons, while the increase in death rate among breast-fed infants is slight.

Every consideration shows the advantage of employing the maternal method of nutrition while the infant's digestive organs are developing, and breast-feeding should always be advocated unless contraindicated (see p. 105).

Preparation for Maternal Feeding.— For some months before delivery, the nipples should be treated so as to prepare them and thus prevent tenderness or fissure when the infant nurses. This is done by gently rubbing and applying such a lotion as the tincture of benzoin. Depressed or misshaped nipples may thus be made usable, and the comfort of the mother will also be conserved.

Management of Breast-Feeding.— When the mother is enough rested after delivery the infant should be offered each nipple. If it does not seem satisfied and becomes fretful or restless, a teaspoonful or two of boiled water may be given. This will quiet the infant and helps to flush out the digestive tract and kidneys.

For the first day of two the infant may be offered the breast every three hours during the day and twice during the night, at four- to six-hour intervals. After this it should be nursed every two hours during the day and once or twice at night.

When the supply of milk is sufficient the infant will suck for fifteen to twenty minutes and then drop off to sleep. If after having the nipple twenty to thirty minutes the infant seems restlses and unsatisfied it may be suspected that the milk supply is insufficient. A weighing before and after nursing will help to determine whether the amount has been sufficient. After the first few weeks such a test should show an increase in weight of between two and three ounces.

If under such management the infant has soft yellow stools with no pronounced signs of indigestion and gains steadily in weight, it may be considered as doing well.

Regularity of Feeding Important.— One of the most fruitful causes of indigestion in breast fed infants is feeding at irregular, and especially at short intervals. Sometimes a fresh feeding is taken into the stomach before the previous meal has been digested, which is bad enough; but in addition to this, the irregularity in nursing has a profound effect on the composition of the mother's milk.

If the intervals between nursings are long there will be a large quantity of rather poor milk: but when the milk is drawn at short intervals it has the effect of reducing the quantity and greatly increasing the percentage of fat, the other ingredients not being affected to any great extent. An excess of fat in the food is apt to produce vomiting, and an abnormal gastric secretion may follow, causing the milk to curd or solidify abnormally: hence it is not difficult to see why frequent nursing causes digestive disturbance. When milk is drawn at regular intervals it has practically the some composition, unless the mother has been subjected to influences that derange her nervous system. These may profoundly alter the character and composition of her milk and produce great disturbances in the infant. It is, therefore, of the greatest importance to have the mother regular in her own habits and free from excitement, and that the infant be fed at regular hours. It will be helpful if the mother is given directions for feeding by the clock, as at 5, 7, 9, 11 A. M.; 1, 3, 5, 7, 9 P. M., and once during the night in occasional cases.

Milk Agrees, Flow Scanty.— When the mother's milk agrees with the infant, but is not sufficient in quantity to cause it to gain in weight steadily, attempts should be made to increase the flow, and when these are not successful, mixed feeding, that is, part breast and part artificial feeding, must be employed.

If the mother is to secrete sufficient milk she must digest and assimilate a liberal supply of food herself, for unless she does this the milk will be produced from her own tissues and she will lose in weight. The diet of the mother should consist of simple, easily digested food in liberal quantity, milk, eggs, meats, and thoroughly cooked cereals being the mainstay. Tea and coffee should be withheld or used sparingly, cocoa or chocolate being given in their place.

Southworth, who has devoted much attention to this matter, recommends the use of cornmeal gruels to be taken between meals as a means of increasing and conserving a scanty flow of breast milk. When cornmeal gruel is not relished, oatmeal gruel may be substituted. The gruels are made as follows:

Two to four heaping tablespoonfuls of yellow cornmeal or rolled oats are placed in one quart of cold water in a double boiler and the water in the boiler is kept boiling for two or three hours. The gruel is then strained through a coarse wire strainer and enough boiling water is added to make one quart of gruel. The gruel should be well salted. It is often advantageous to add an equal quantity of milk.

A pint of such gruel is to be taken about ten o'clock in the morning and again at about three in the afternoon. The gruel, when dextrinized, supplies energy food in a form quickly assimilable, and the coarse particles of the gruel undoubtedly promote normal action of the bowels and thus promote the general well-being of the mother and incidentally that of the infant. When there is anemia iron should be administered.

Elimination of Drugs and Excretory Products in Milk.— It is a well-known fact that some substances pass into the milk from the mother's system which may unfavorably affect the infant. Constipation of the mother will affect the infant unfavorably, and under certain conditions urea in appreciable quantities finds its way into the milk. When the mother is constipated and the use of cornmeal gruel does not overcome the condition, cascara should be given.

Great care must be exercised in giving drugs to nursing women, as they may be excreted in their milk. Morphin, mercury, quinin, iodid of potassium and similar preparations should be given cautiously and their effects watched.

Milk Plentiful, but Disagrees with Infant.— As a general rule, the milk of the mother will agree with her infant. However, there are some women whose milk may at times be excessively rich in all of its elements or may fluctuate widely in the amount of fat present or have properties that make it unacceptable to the infant.

If the milk agrees with the infant for a time and then suddenly disagrees the probabilities are that the mother has been subjected to excitement of some kind; it may be worry, fright, anger, grief, or loss of sleep that has made her irritable. Such influences will produce sudden changes in the character of milk and alter its digestive properties. It is well known that the milk of a cow that has been overheated, driven rapidly, or made irritable by flies or dogs, will not react normally to rennin and acid. The changes brought about by these nervous influences are more than variation in percentage composition, and cannot be detected by chemical analysis. The remedy in this class of cases is to remove all causes of anxiety and nervous disturbance, and have the mother sleep in another room so that she shall not be disturbed by the infant's crying. Pleasant surroundings, and moderate daily exercise in the fresh air are also indicated.

Sometimes the milk of one breast is perfectly satisfactory while that of the other causes disturbance. In such cases the remedy is to secure all of the feedings from the good breast if possible until the other one secretes normal milk.

When the milk disagrees from the start and the mother seems healthy it is possible that the trouble is caused by the milk being too rich, the result of overeating on the part of the mother. At any rate it is helpful in all of these cases where the milk disagrees to make an examination of it, as will be explained below.

If it is found that the amount of fat and total solids in the milk is too high the diet of the mother should be restricted, and exercise to the point of fatigue, to divert the food supply from the breasts, may be advised. It may also be necessary to give saline cathartics. If there is an over-abundant supply of rich milk, the infant should be allowed to take only the first milk from each breast and thus avoid the extra fat " strippings " or the last milk secreted which contains a much higher percentage of fat than the first part of the secretion. If the infant has curdy stools and colic, a tablespoonful of barley water, limewater, or water containing one grain sodium citrate may be given just before each nursing.

If the methods of management suggested above do not overcome the difficulty, so that the infant gains from four to six ounces a week, with good digestion and normal stools, it will be necessary to resort to mixed feeding. Give a bottle every other feeding, using a formula suitable for a younger infant at the beginning, as described on page 134.

Examination of Breast Milk.— There are two ways of examining breast milk: (1) by having an analysis made showing its percentage composition expressed in proteins, mineral matter, fats, carbohydrates, and water; (2) by roughly determining these ingredients by means of the amount of cream that will rise on a given quantity of milk and the specific gravity of the milk.

The chemical analysis of milk is expensive, and its value is apt to be overestimated. It takes several days to get a report from the laboratory where it is made, and laboratories for this purpose are not always available. The second method of determining facts and specific gravity takes twenty-four hours, but can be utilized anywhere. A specimen of the milk is drawn from the breast, care being taken to get all there is, because the first portion contains little fat, while the last portion or " strippings " is very rich in fat. The milk is mixed and its specific gravity is taken with an ordinary urinometer. Ten cubic centimeters of the milk are then placed in a graduated ten c.c. tube or graduate and allowed to stand twenty-four hours for the cream to rise. Poor milk will have a small layer of cream and rich milk a much thicker cream layer. The amount of fat in the milk is thus estimated. The specific gravity of normal human milk is about 1.031. If the milk shows a layer of cream not over one c.c., and has this specific gravity, it may be looked upon as normal milk as far as percentage composition is concerned. If the specific gravity should be as low as 1.028, with more cream, it would indicate that the milk was rich in fat, as the fat being lighter than the milk serum reduces the specific gravity of the milk.

This method is widely used in the dairy industry for calculating the composition of cow's milk, but the fat is accurately determined by the Babcock test, which may also be used with human milk. About half an ounce of milk is required for this test, but if this quantity cannot be obtained, what is available may be diluted with water two or three times after the specific gravity has been obtained and the result multiplied by the number of times the milk was diluted.

If the specific gravity is above 1.030 and there is little cream, or fat shown by the Babcock test, the milk is poor in fat and normal in other solids, or all of the milk was not drawn from the breast and that portion containing the fat was left behind. A second specimen should be drawn and greater care taken to get all there is. The milk should be drawn at the regular nursing interval or milk extra rich in fat will be obtained, for, as stated before, milk drawn at short intervals is abnormally rich in fat.

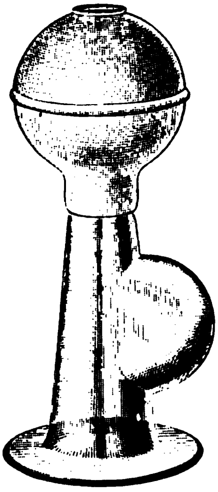

Fig. 31.— Breast pump.

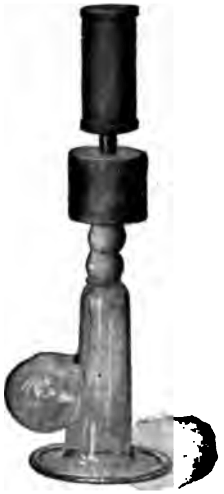

Fig. 32.— Hoover breast pump.

An estimation of the total solids and solids not fat may be obtained from these figures, *i. e.*, the last two figures of the specific gravity divided by four and adding one-fifth of the percentage of fat which gives the solids not fat — then if the fat is added to these solids we obtain the total solids.

For example: (Sp. gr. 1028 — butter fat 5%) 28 ÷ by 4 = 7 + ⅕ (of 5%) = 7.1 solids not fat + 5 or 12.1 = total solids.

At one time great importance was laid upon the reaction of breast milk. It was supposed always to be alkaline or amphoteric in reaction. At present comparatively little importance is attached to the reaction of breast milk, for the same specimen of milk may be found to be acid, amphoteric, and alkaline, all depending upon how the reaction is determined. Litmus-paper was the substance used to determine the reaction of milk, a strip being dipped into the milk and its reaction judged by the change of color of the litmus-paper. Litmus and litmus-paper vary a great deal in sensitiveness, and all kinds of reactions can be obtained with milk by using different lots of litmus-paper. Phenolphthalein in 1 per cent. alcoholic solution is now used as the indicator in testing the reaction of both human and cow's milk, as it is many times more sensitive than litmus. Lime-water is usually employed in neutralizing acidity in milk, and it takes about 10 per cent. to 20 per cent. to make human milk alkaline to phenolphthalein. With a better understanding of the chemistry of milk and the process of its digestion, it is seen that undue importance was placed upon its reaction and composition, and simpler and better methods of clinically testing the suitability of breast milk are coming more into use.

Nursing not Possible.— When the nipples are fissured it is impossible for the infant to nurse, and the milk should be drawn with a breast pump, two forms of which are shown in Figs. 31, 32. The Hoover breast pump (Fig. 32) will be found convenient and easy to use. Heating an empty bottle and placing the neck over the nipple will sometimes prove satisfactory in collecting milk. The milk may be fed through a medicine dropper or from a small nursing bottle. Pumps and bottle should be kept scrupulously clean.

Where there is but a slight fissure or abrasion which causes pain to the mother, a nipple shield (Fig. 33) may be used. It is best to fill it with warm water so that the infant will not have to exhaust the air it contains before obtaining any fluid. It is also well to massage the breasts to aid in securing the milk. The nipples should be carefully washed with a solution of boric acid and dried after use.

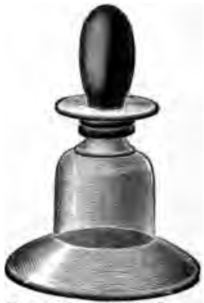

FIG. 33.— Nipple shield.

Contraindications for Nursing.—When the mother is anemic and is losing weight and shows signs of exhaustion, even after tonic treatment has been employed; or when she is nervous and excitable to such an extent that her milk continually disagrees with the infant, supplemental or complemental feeding should be first tried. If when menstruation is resumed the milk disagrees, artificial feeding may be employed temporarily, and after the period has passed breast-feeding may be commenced. In the meantime the breast should be emptied with a breast pump at regular intervals to keep up the secretion. If the milk disagrees but slightly it may not be necessary to feed artificially.

If pregnancy occurs it may be necessary to employ substitute feedings, but in the middle of a hot summer it will be better to continue the breast-feeding, if it is not too much of a strain on the mother, than to risk the dangers of commencing artificial feeding in hot weather. Mothers affected with tuberculosis should under no circumstances be permitted to nurse their infants. Diseases such as typhoid, pneumonia, and septicemia in which there is much pyrexia and prostration also are contraindications to nursing.

A wet-nurse with syphilis must not be allowed to nurse any other infant than her own.

An otherwise healthy mother may without fear nurse her syphilitic infant, for we believe to-day that she is infected, having borne a syphilitic child.

Weaning and Mixed Feeding.—When the physician has satisfied himself beyond doubt that the mother's milk has failed in quantity or quality, it becomes necessary to commence substitute feeding to make up the deficiency. It is a good plan to have one bottle a day given to a nursing infant about the third month so it shall be trained to its use and the mother trained in the preparation of food. This will be much appreciated in cases where sudden weaning becomes necessary. The substitute feeding may alternate with breast-feedings, and as the breast secretion fails the number of bottles given may be increased one at a time. In this way the transition is gradual and digestive disturbances are avoided. During the first few weeks of life, when the nursing mother has little milk, a small amount may be given from the bottle immediately after nursing if the infant gets too little from the breast.

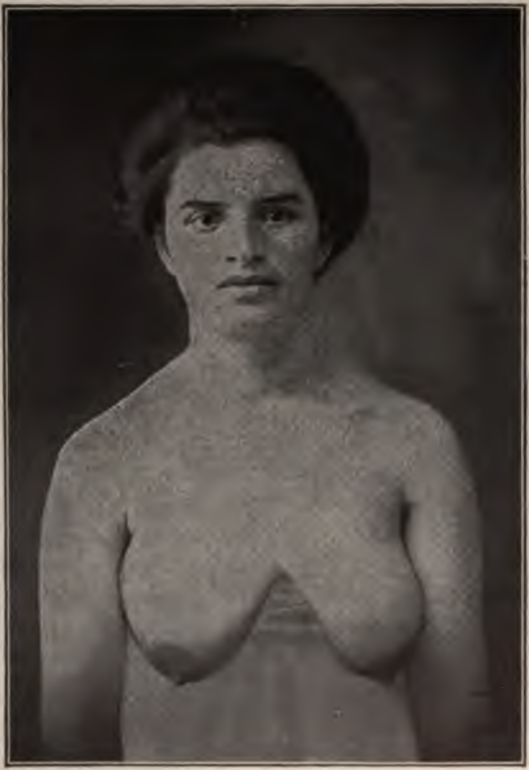

FIG. 34.— Preferable type of breasts for wet-nursing.

Whenever sudden removal from the breast becomes necessary a wet-nurse should be employed if possible, as no substitute feeding can compare with good wet-nursing.

Selection of a Wet-nurse.— In selecting a wet-nurse, we must consider her age, her general health and development, her probable nervous status, and the age and health of her infant. The preferable age for the nurse is between twenty and thirty years, and multiparæ are apt to do better than primiparæ on account of having had charge of the suckling and general care of infants. A careful physical examination of the applicant should be made by the physician. Constitutional taints, especially syphilis and tuberculosis, must be excluded by a painstaking history and thorough examination of the mouth, lymph-glands, skin, and other parts likely to show evidences of infection. If any vaginal discharge is present, it must be examined for gonococci. The best breasts for satisfactory suckling are not the large, firm ones, but rather the more flabby and pendulous kind, as shown in Fig. 34. The nipple must be of good form and size and sufficiently protuberent for easy grasping by the infant, and free from fissures and abrasions. A woman of quiet, phlegmatic temperament, in good health, is to be preferred, as nervous instability has a quick effect on the composition of the milk. A woman whose infant is under six months can usually suckle a new-born baby, but a less disparity between the ages of the infants is desirable if it can be attained. A careful examination of the nurse's infant must be made to exclude any constitutional disease, and a blood examination for the Wassermann reaction should be made. The examination will also show how well the infant has thriven upon its mother's milk. The diet of the wet-nurse, when selected, should be as nearly as possible that to which she has been accustomed, avoiding a too great variety and quantity of food. If she is furnished a diet richer and more abundant than she is accustomed to, she will in all probability overeat and bring on either defective digestion or excretion, which will promptly disorder the digestion of the infant. Regular outdoor exercise must also be insisted upon. Several nurses will sometimes have to be tried before a breast that agrees with the baby is found.

CHAPTER XIII.

THE PRINCIPLES AND THE MATERIALS USED IN SUBSTITUTE FEEDING.

Difficulties Encountered.— In taking up the study of the artificial feeding of infants, one of the first impressions received is that the whole subject is undetermined. Methods that give good results in some instances totally fail in other cases. One infant will thrive on a quantity of food that is insufficient for another of the same age; another may gain in weight rapidly and still not be rugged and well-developed. The parents may be poor, ignorant or careless, and great difficulty may be experienced in getting a supply of suitable food, or in having the food prepared and administered properly. Learning the formulas of a few food mixtures will never make a good or successful infant feeder. What is required is a clear conception of what are the essential principles involved in artificial infant-feeding in health and disease, and a working knowledge of how to prepare food so that these principles may be complied with under different conditions.

Principles that Apply to All Infants.— All infants require a certain quantity of proteins and mineral matter to replace normal metabolic waste, and enough fats and carbohydrates to supply the energy needed to carry on the processes of life. A food that supplies exactly these quantities of the food elements is called a *maintenance ration,* and on such a food the infant would neither gain nor lose. Oftentimes in cases of illness it becomes necessary to put infants on such food, and the parents may feel the infants are being starved, but they are not on a starvation diet by any means; growth is suspended temporarily, but the infant is holding its own.

After the portion of the food needed for maintenance has been appropriated, what remains, if any, may be utilized for growth or for causing gain in weight which does not necessarily mean that the infant is really growing. Growth consists in an increase in number of the cells of the various tissues, and as these are composed principally of proteins and water the food must contain a greater quantity of proteins than is required to replace waste, if growth is to be made possible, for cells cannot be formed from fats and carbohydrates. A rapid gain in weight may result if the food given contains only a little more protein than is necessary to replace waste, but considerable fat and carbohydrates, as the excess of these ingredients is converted into body fat which causes increase in weight. To those not familiar with the principles of infant-feeding this gain in weight is strong evidence that the food is suitable for the infant, but not so much importance is attached to mere gain in weight as formerly. If the food is known to contain a liberal supply of proteins, and gain in weight follows its use, it is considered that the gain in weight is caused by true growth, as it is characteristic of young animals of all kinds to greedily assimilate and convert into tissues the proteins that the food contains in excess of that needed to replace waste, within reasonable limits. Proper growth hinges on the proteins of the food.

If the food contains a relatively large proportion of proteins with a too small proportion of fats and carbohydrates the proteins will be used to supply energy which could just as well be furnished by fats and carbohydrates, and growth will not take place. If the quantity of fats and carbohydrates is increased and the amount of proteins decreased somewhat the infant will be able to make a satisfactory growth, therefore it is important to have the food elements present in the food in certain relative proportions if best results are to be obtained.

The essentials of artificial infant feeding are: a liberal supply of proteins and mineral matter for the construction of additional tissue, which means growth; a sufficient supply of fats and carbohydrates to furnish energy, and all in forms that can be not only digested by the infant, but which permit the development of vigorous digestive organs. A strong digestive apparatus is of great importance in after-life, and by proper selection of food in infancy the foundation for good digestion later on can be laid.

Cow's Milk; General Composition.— Chemical analysis shows the milk of all cows to be composed of proteins, mineral matter, fats, carbohydrates, and water, but the proportions of these ingredients are not the same in all specimens of milk from the same cow or from the cows of different breeds. The composition of milk depends largely on the breed of cow, the individual peculiarities of each cow, and the time and manner of milking.

One Cow's Milk.— It was formerly believed that the milk of one cow was preferable to the mixed milk of a herd of cows for use in infant-feeding, but as improved and more sanitary methods of handling herd milk have done away with much of the contamination which brought such milk into disrepute, it is now much better to use the mixed milk of a large number of cows, especially as it is more uniform in composition, less liable to sudden fluctuations, changes of properties, and disease carrying possibilities.

The range of composition of the milk of single cows has been found to be from 2.25 per cent. to 9 per cent. of fat, and 2.19 per cent. to 8.56 per cent. proteins (Van Slyke), while in mixed herd milk there is seldom much of a range of variation, the fats running almost never below 3 per cent. and very seldom over 5 per cent., except in the milk of high-bred Guernsey and Jersey cows; while the proteins will almost always run between 3 per cent. and 3.5 per cent.

Influence of Breed on Composition of Milk.— The milk of different breeds of cows shows marked differences of composition and no amount of effort will make the cows of one breed give milk of the same character as the cows of another breed. Holstein cows will give milk containing about 3 per cent. fat, 2.80 per cent. proteins, and 4 per cent. carbohydrates, while Jersey cows will give milk containing as high as 5.5 per cent. fat, 3.60 per cent. proteins, and 5 per cent. carbohydrates.

Bacteriology of Milk.— Milk as secreted by a healthy udder is practically sterile, but just inside the teat is a "milk cistern" to which bacteria from outside find access. For this reason the first three or four jets from each teat should be discarded and then the milk will be quite free from bacteria if received under proper conditions into sterile pails. Milk from unsanitary dairies contains hundreds of millions of bacteria to the cubic centimeter, but fortunately most of these bacteria are saprophytes, and the harm they do is chiefly in souring the milk by converting its sugar into lactic acid or decomposing the proteins. In hot weather the heat favors development of new bacteria and the milk does not keep. This led to a demand for sterilization or pasteurization, but it has since been found that it is much better to produce milk under sanitary conditions and thus keep down the number of bacteria than to kill them by heat after they have been allowed to get into the milk.

In the modern dairy the milkers wash their hands and wear clean clothes. They sterilize the milk pails and cans. If there is an infectious disease, such as scarlet fever or typhoid fever in the family of any of those who handle the milk they are not allowed to take part in its production.

The principles involved in the production of wholesome milk are now well understood, and are being applied more and more even in remote parts of the country, and good milk suitable for feeding infants can be produced anywhere by the exercise of care and cleanliness.

Production of Sanitary Milk.— All that is needed to produce milk suitable for feeding infants are cows that are free from tuberculosis or other disease, a stable that can be kept clean — an ordinary barn will do — and careful attention to keeping the cows and utensils clean. The cows are to be cleaned daily and kept as sleek and clean as horses. The hair on the udder is to be kept cut short and the udder and belly are to be wiped off with a damp cloth just before milking. No loose hay or manure is to be left in the stable when milking is going on, as dust from them carries bacteria with it into the milk. All utensils are to be washed with boiling water, and steamed if possible. The milker should wear clean clothes, and his hands should be washed with soap and water just before milking. The first few streams of milk from each teat should be thrown away, not into the milk pail, but into the manure gutter, and the milking should then proceed into a small-mouth pail. The milk should then be strained through a sterile cloth and cooled and iced and kept iced until ready for consumption.

The bacterial condition of milk is of as much importance as its chemical composition and should never be left out of consideration. It is well also to remember that methods of milk production in America and Europe are totally different, and that European literature on this subject does not always apply to American conditions.

Market Milk.— From a commercial standpoint milk may be divided into three grades: (1) "Grocery milk," such as is sold at very low prices in city grocery stores, especially in the tenement districts, and dipped out of cans into the family pitcher; (2) bottled milk, such as is delivered to families in glass bottles in the more well-to-do sections; (3) sanitary, inspected, or certified milk, which is also sold in bottles.

Grocery milk is produced at as low a cost as possible and contains enormous numbers of bacteria, as no more care is taken in its production than the health authorities insist upon. It is a poor food for infants, especially in hot weather, when it may be positively dangerous.

Bottled milk is generally produced under much better conditions than grocery milk and sells for about double the price of the grocery milk. It forms a satisfactory milk for infant feeding in a large number of instances.

Sanitary, inspected, or certified milk is produced under the supervision of a commission of physicians, usually appointed by a local medical society. Such commissions furnish standards of cleanliness and bacterial count which are to be complied with. Then if the milk when taken at random from the milkman's delivery wagon comes up to the standard, he is furnished with a label certifying that the milk is of the required quality, or "certified milk," as it is often called. The standards fixed by "milk commissions" in different cities are not all alike. In Philadelphia, for instance, the number of bacteria per cubic centimeter must not exceed ten thousand, while in New York the maximum number must be not over thirty thousand per cubic centimeter. Certified milk is the safest and best milk obtainable for use in infant feeding, and can now be had in most large cities and in some small ones. There is no reason why it should not be obtainable anywhere. Any progressive dairyman or farmer can produce it. The price of this milk is 50 to 100 per cent. higher than that of ordinary bottled milk.

It is important that the certification be done by some competent medical authority, and no milkman should be allowed to do his own certifying.

Pasteurized and Sterilized Milk.— By heating the milk to about 160° F. for about twenty minutes the great majority of bacteria present are destroyed. Such treatment of milk is called pasteurization. If the milk is heated to 212° F. it is said to be sterilized, as all of the bacteria are destroyed. In both of these processes the bacterial spores survive, and if the milk is not kept below 50° F. they will germinate, and soon the milk will contain as many bacteria as it did originally, but the type or kind of bacteria will not be the same. Bacteria that convert the sugar of milk into acid and cause souring are the predominating kinds in fresh milk, and the acid they produce retards the growth of other types, until, when milk is nearly soured, 95 per cent. of all the bacteria present are acid producers. Heating the milk to about 150° F. destroys the acid bacteria and leaves a free field for bacteria that attack proteins. Therefore pasteurized or sterilized milk does not readily sour, but its proteins are often partially decomposed by bacteria produced from spores which escaped destruction, and such milk may cause considerable digestive disturbance. Pasteurization or sterilization may be used to take the place of cleanliness in producing milk, but it is not to be advocated for this purpose. If the milk is suspected of containing pathogenic bacteria, then it should be pasteurized, but this should be done at the dairy, so that there shall be no opportunity for contamination between the time the milk is bottled and the infant receives its food, for pasteurized milk is just as liable to be unhealthful as fresh if it is not protected from reinfection. Sterilized milk is not used to any great extent because it has a cooked taste. Pasteurized milk tastes very much as fresh milk does, although a difference is discernible. Heating milk in some way alters it so that it is not solidified by rennin as quickly as fresh milk, and this property is often taken advantage of in preparing food for infants in whose stomachs fresh milk solidifies too rapidly. Heating the food may make it digest satisfactorily.

Milk for the general bottled trade will contain between 3.5 per cent. and 4 per cent. of fat, about 3.20 per cent. proteins, and 5 per cent. sugar and mineral matter. Bottled milk from fancy Jersey cattle will contain from 4.5 per cent. to 5.5 per cent. fat, 3.5 per cent. proteins, and 5 per cent. sugar and mineral matter. Certified milk generally contains 4 to 5 per cent. of fat, with the other ingredients about the same as in good bottled milk.

Cream.— There are two kinds of cream sold by milk dealers; (1) gravity cream, or that which rises naturally if the milk is allowed to stand; (2) centrifugal cream, or that which is separated by passing the milk through a centrifuge running at a high rate of speed. The percentage of fat in cream varies, running all the way from 16 per cent. up to 40 per cent. Some gravity cream may run as low as 16 per cent. and as high as 25 per cent. Centrifugal cream can be made of any desired percentage of fat by adjusting the centrifuge. There are marked physical differences between gravity cream and centrifugal creams. Centrifugal cream is much

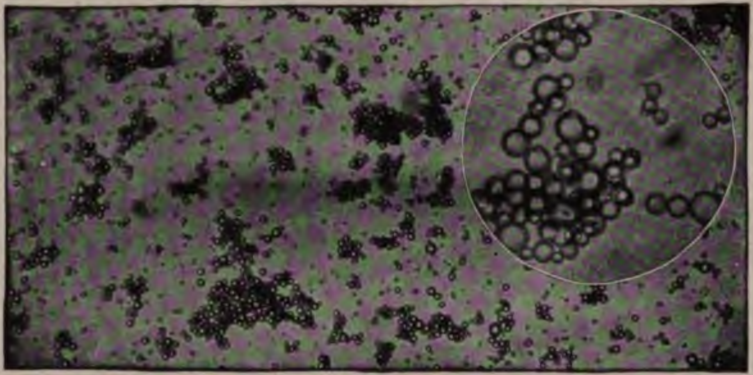

FIG. 35.— Microscopic appearance of normal milk. (*Babcock and Russell.*) Fat globules in clusters.

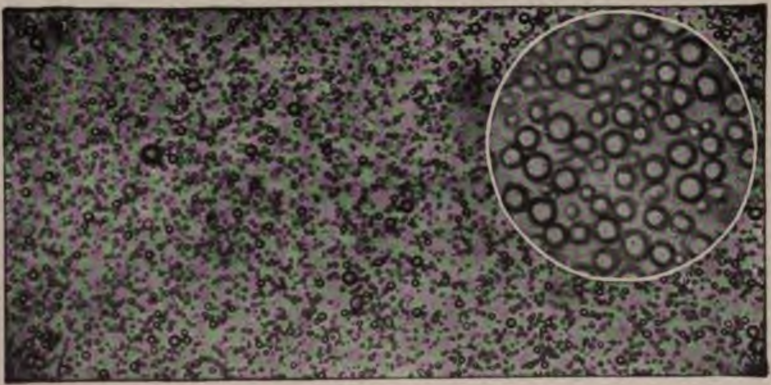

FIG. 36.— Microscopic appearance of centrifuged, or heated milk. (*Babcock and Russell.*) Fat globules not in clusters.

thinner than gravity cream of the same composition. Figs. 35, 36 show the microscopic appearance of normal milk and milk that has been centrifuged or heated.

Condensed Milk.—There are on the market, and widely used, a large number of brands of condensed milk. These are made by evaporating milk in vacuum pans, at a low temperature, after it has been brought near the boiling-point. If it is to be sold in the fresh state it is then run into cans and shipped to market. Otherwise, granulated sugar is added and the milk is then put into small cans and hermetically sealed. Such milk is known as sweetened condensed milk. It is a one-sided diet containing an excess of carbohydrates. It will make children very fat because they change its excess of sugar into body fat, but when it is diluted so they can digest it the percentage of proteins or blood and muscle-forming portion of the food is not much more than half that of mother's milk, and of course the infant cannot grow properly on it. There is also a great deficiency in fat.

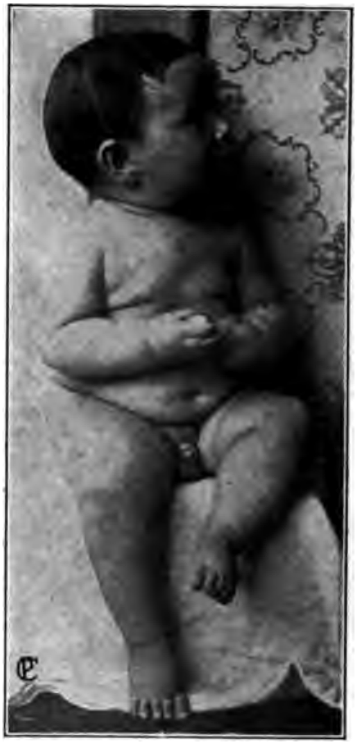

Fig. 37.—Obesity with lack of proper musculature, resulting from high carbohydrates and low protein.

Evaporated Milk.—There is also sold in cans what used to be called "evaporated cream" but which since the passage of the "Pure Food and Drugs Act" in 1906 is called by its true name "evaporated milk." This is condensed milk which has been canned without the addition of sugar. It has a creamy consistency and when diluted with water is very much like sterilized milk. It does not sour readily, but is liable to putrefaction, and for this reason is put up in small cans that must be used up soon after opening. It will not keep when opened as will the regular condensed milk.

Mammala.

Mammala is a dried milk prepared from whole milk from which a portion of the cream has been removed, and some milk sugar added. It is dried by the Hatmaker process at a temperature of 280° F.

It should be regarded as a substitute for cow's milk, especially where a wholesome product is not available or for purposes of traveling, as it keeps well and no refrigerator is required.

It is prepared by dissolving the required amount for each feeding in hot water. No extra sugar is needed.

Mammala contains approximately:

Fat	12.12
Proteins	24.35
Milk Sugar	55.34
Ash	4.93
Water	3.26
	100.00

Cereals.

The various cereals play an important part in artificial infant-feeding, and when used intelligently are of great service. In feeding sick infants and for tiding over a period when milk is not tolerated, the cereals and products derived from them are the main reliance. But it should also be remembered that if used injudiciously they may cause considerable disturbance.

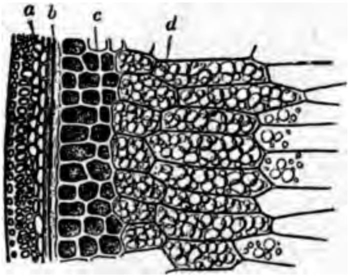

FIG. 38.— Barley grain. (*Goodale.*) *e*, Protein layer; *d*, starchy portion.

General Properties of Cereals.— All cereals are composed of fats, carbohydrates, proteins, and mineral matter in different proportions. The amount of fat in wheat flour is about 1 per cent., while the quantity in oatmeal is about 9 per cent. Barley flour may contain as high as 3 per cent. fat, while pearl barley will contain as little as 0.7 per cent. fat. Their proteins vary in much the same way. Barley flour may contain as high as 13 per cent. and as low as 7 per cent. proteins. These differences are largely due to the methods of preparing the cereals for use. Fig. 38 is an illustration of a cross section of a cereal in which it will be noticed that the proteins are found in the outer layers of the grain. In making pearl barley the outer layers are ground off, leaving the interior portion which contains a relatively high proportion of carbohydrates or starch. Accordingly, a sample of barley may contain 13 per cent. proteins and 74 per cent. carbohydrates, and after it has been "pearled" it will contain 7 per cent.

proteins and 77 per cent. carbohydrates. The proteins of barley make an exceedingly sticky dough when the flour is mixed with water, and for this reason it is desirable to remove a portion of the protein for certain purposes in cooking and some flour is made from barley from which the protein layer has been removed. Such flour stirs into water very easily and for cooking purposes is very convenient. From a nutritive standpoint such flour is not the best, as in infant-feeding particularly, the main object is to give as much proteins as can be utilized, and cereals containing the full quantity of protein are to be selected.

Carbohydrates of Cereals.— The skeleton and tissues of plants are composed of carbohydrates, while in animals the tissues are mostly proteins. Naturally, then, the cereals are composed largely of carbohydrates, the proteins which are only necessary for the formation of new protoplasm being present in smaller amounts. The carbohydrates may be in a number of forms, and the plant and its germ has the power to change one form into another as is needed. When the reserve or starch is drawn upon the starch first becomes soluble, and is then changed into dextrin and finally into maltose. These changes can readily be brought about in preparing food for infants, and this fact is of importance, for oftentimes carbohydrates in the form of starch will not be acceptable, when by being converted into soluble starch, dextrin, or maltose they will not only be well digested, but will bring about a marked improvement in general conditions. Many of the proprietary infant foods are made in whole or in part of cereals which have been treated so as to affect the properties of their carbohydrates, or starch. Details for preparing cereals for infants will be found on page 136.

Eggs.

Eggs.— These are to the animal kingdom what the cereals are to the vegetable kingdom — a germ with material which it can use in forming an animal organism which is capable of digesting food from other sources. As the animal tissues are almost entirely made up of proteins and water, eggs naturally are likewise composed principally of proteins and water. They also contain fat, and lecithin from which nerve tissue may be formed, and organic iron for blood formation. Eggs of different animals vary in composition according to the development of the young when hatching takes place. Hen's eggs are the ones principally used and these contain enough of the food elements in suitable form to make all kinds of tissues.

Eggs, therefore, are very useful additions to diet during the growing period, and especially when the infant is beginning to eat table food and needs easily digested proteins.

Dextri-Maltose.— This is a preparation of malt-sugar consisting of maltose, 51 per cent.; dextrin, 47 per cent.; sodium chlorid, 2 per cent. Each ounce has a food value of 110 calories. It is a readily absorbable sugar containing no cellulose, fats or proteins. It often agrees better than milk or cane sugar, and is especially indicated in infants in whom it is desired to get an increase in weight without causing sugar disturbance.

Proprietary Infant Foods.

General Properties.— Before the subject of infant-feeding was as well understood as it is at present, many attempts were made to furnish artificial foods which should take the place of mother's milk and of cow's milk. For a time they served a useful purpose and when it was impossible to obtain a supply of good cow's milk they were of considerable value, as very often they were retained and saved the infants from starvation or serious digestive disturbance caused by contaminated milk. On them many infants gained in weight and thrived temporarily, but frequently these infants developed rickets and scurvy, or were poorly developed and of feeble constitution, and consequently were carried off by the first serious sickness. All of these foods are composed of proteins, mineral matter, fats, and carbohydrates. In some the amount of fat is infinitesimal, the protein low in quantity and the carbohydrates very high. None of them are at all like mother's milk in properties. They often contain only enough protein to but little more than make up for metabolic waste, but the carbohydrates are in such a form that they are easily assimilated and converted into fat which causes increase in weight.

All of the proprietary infant foods are composed of cereals, sugars, dried milk, and eggs, either singly or in combinations that have undergone special treatments. Chemical analyses show little or none of their properties except their possible nutritive value.

Classification of Proprietary Infant Foods.— A clear idea of what the infant foods on the market are like will be obtained if they are classified according to the materials from which they are made, and according to this plan they will all fall into about three or possibly four distinct groups or classes, as follows:

Group 1. **These are mixtures of dried cow's milk in small proportion with large amounts of milk-sugar, dextrin, maltose, or starch** derived from cereals. As prepared **for the infant's bottle, these foods are low in fats and high in carbohydrates.**

	Water	Protein (N x 6.25)	Mineral matter	Fat	Nitrogen-free extract (Carbohydrates)	Lactose	Starch	Microscopical examination
Allenburys' Milk Food, No. 1	5.32	9.93	4.00	13.00	67.75	32.83		No starch.
Allenburys' Milk Food, No. 2	4.98	9.00	3.69	13.72	68.33	27.14		No starch.
Borden's Malted Milk	5.42	13.38	3.17	6.14	71.66	0.61	0.62	No starch; cereal chaff, hairs, and gluten cells.
Meadow's Malted Milk	4.04	13.88	3.22	4.11	74.49	0.43	0.62	No starch.
Horlick's Malted Milk	3.63	12.94	3.70	8.36	71.37	0.39		No starch.
Nestlé's Food	3.53	11.56	2.24	5.75	76.92	0.21	15.90	Raw and cooked wheat starch.
Carnrick's Soluble Food	3.10	12.25	2.00	1.14	80.97	0.31	16.20	Cooked starch; wheat tissues.
Cereal milk	5.32	10.38	2.20	4.06	78.01	12.06	2.93	Small amount of starch..
Lactated food	7.12	8.13	1.19	0.72	82.84	9.67	41.94	Distorted wheat starch.
Carnrick's Lacto-Preparata	2.45	11.44	2.94	2.26	80.91	63.71	2.81	Trace of starchy material.

The infinitesimal proportion of lactose or milk-sugar in some of these foods shows that very little milk enters into their composition, as fresh milk contains about 5 per cent. of lactose; and the high percentage of lactose and small percentage of protein show that other foods contain little milk, as whole milk contains 3.2 per cent. proteins.

Group 2. These are farinaceous foods in some of which an effort has been made to change the starch into a soluble form or into dextrin and maltose. The analyses show, however, that most of them contain starch in large amount. They are intended to be used as dilutents of cow's milk which is to furnish the fat in which they are greatly lacking.

	Water	Protein (N x 6.25)	Mineral matter	Fat	Nitrogen-free extract (Carbohydrates)	Lactose	Starch	Microscopical examination
Allenburys' Malted Food, No. 3..	5.94	11.38	1.00	0.80	80.85	0.23	66.30	Slightly distorted starch.
Benger's Food for Infants.......	8.61	12.00	1.07	0.83	77.47	0.36	59.57	Raw wheat starch.
Imperial Granum Food..........	5.86	13.13	0.45	0.44	80.08	0.21	73.97	Distorted wheat (?) starch.
Fessenden's Food...............	5.95	6.00	1.60	0.40	85.97	0.36	35.69	Raw arrowroot starch.
Just's Dietetic Cereal Food......	6.30	0.81	0.41	0.04	92 44	0.13	2.64	No raw starch.
Mellin's Infant Food............	5.07	10.50	3.79	1.15	79.24	0.37	....	No starch; gluten cells.
Sunbright's California Baby Food.	9.00	7.94	1.09	0.70	81.05	0.19	63.25	Distorted cereal starch, probably barley.
Taroena.......................	11.82	1.50	1.53	0.44	83.84	0.45	71.63	Cells filled with cooked starch; vessels.
Ridge's Food..................	9.24	11.81	0.60	1.04	77.26	0.12	69.46	Raw wheat starch.

Group 3. This is a miscellaneous class, consisting principally of milk-sugar, or cereals with egg albumin, or malted cereals with beef and milk.

Eskay's Albumenized Food......	3.06	6.56	1.34	1.20	87.80	39.68	28.41	Raw arrowroot starch, cooked cereal starch.
Wampole's Milk Food..........	6.17	15.31	4.98	4.53	68.64	0.36	....	No starch.

Group 4. This group is represented by peptogenic milk powder, which is essentially a peptonizing powder mixed with milk-sugar'

Peptogenic Milk Powder........	3.02	0.81	1.40	0.10	94.67	90.53	....	No starch or vegetable tissues.

The composition of the food when it is in the infant's bottle will depend absolutely on how much of the proprietary food is used or on the richness and quantity of milk to which it is added. Thus it is manifestly impossible to give analyses which will give a correct idea of the nutritive value of these mixtures.

There is one point, however, which should become fixed in the mind and that is that nearly all of the proprietary foods are composed of carbohydrates mostly, and these carbohydrates are largely if not entirely derived from cereals. Gain in weight is often made on these foods, but unless they are reinforced by milk the tissues are not of the firm muscular character produced by foods richer in proteins.

Sometimes, as when traveling or when a good quality of milk cannot be obtained, the foods that are to be used without fresh milk may serve a useful purpose. But for general purposes of feeding these foods possess disadvantages over food mixtures for which the physician can write prescriptions to be followed by the mother or nurse, after he has become familiar with the principles and methods of artificial feeding.

CHAPTER XIV.

RISE AND DEVELOPMENT OF SCIENTIFIC INFANT-FEEDING.

Historical.— The experience of many successful pediatricians in all parts of the world showed that infants did much better, as a rule, if part of their food was fresh milk of some kind, but it was also found that there was no animal that secreted milk having exactly the same properties as human milk. Therefore attempts were made to make cow's and goat's milk, which were the milks most available, correspond to human milk in composition and properties. Human milk was analyzed, as were also the other milks, and it was found their composition was apparently the same, except that the proportions of the ingredients varied. Cow's milk was richer in protein which formed curds in the stomach; thus arose the process of diluting milk for infant-feeding. It was found that diluting the milk with gruels made from cereals increased its digestibility by softening the curds. Later, it was discovered that if milk was peptonized the curds would not form, or if the milk was only partially peptonized the curds formed were very small, and peptonized milk for infants was looked upon as the solution of the problem. The action of bacteria on milk was recognized, and then sterilization, heating milk to 212° F., was introduced. After a time it was observed that sterilizing unfavorably affected the milk, and pasteurization or heating the milk from 150° to 165° F. was introduced. These processes did a great deal of good under certain conditions, but the problem was not yet completely solved.

After a time it was taught that all milks were composed of the same substances, and that their differences were due merely to different percentages of the various ingredients and unlike reactions. Subsequently a new theory was brought forward, that the difference between human milk and cow's milk was due to the relative proportions of casein (the portion of the protein which is solidified by rennin) and albumin present in each, but this theory has been seen to be untenable, as it was found that caseins differ in properties and that the term casein is about as specific as the term wood.

Since the subject of infant-feeding has been approached from the biological standpoint, the fallacy of the theory of making human milk from cow's milk has become quite apparent.

Fundamental Errors Made.— When the theory was put forth that the differences between human milk and cow's milk were due to unlike percentage composition and reaction to litmus, two important errors were made. In determining the comparative properties of the solids made from the proteins of the two milks, *acid* was added to the milks, and rennin, or the gastric secretion of young animals with which the milk would come in contact in the stomach, was rejected as being an unsatisfactory reagent. The effect on milk of adding acid is totally different from that produced by the addition of rennin. The milk does not meet enough acid in the young stomach to precipitate it but rennin which solidifies it is present; so this basis of comparison was not only erroneous, but misleading. Acid will make a fine precipitate, while rennin makes a solid mass from cow's milk.

When lime-water is added to cow's milk it alters the casein so that it will not form a solid with the rennin of the stomach.

Litmus is not a proper indicator to use in taking the reaction of milk as it is an acid itself, stronger than some of the acids of milk, the presence of which it fails to show.

For testing the reaction of milk, phenolphthalein (1 per cent. alcoholic solution) should be used instead of litmus, and with this indicator breast-milk is also found to be acid in reaction. The effect of adding lime-water is to modify the physical and digestive properties of the casein in the infant's stomach.

The alkalies are now used with a better understanding of their action and effect and their routine use is not considered as advisable as formerly.

Similar errors were made in the theory that the differences between human milk and cow's milk were due to unlike percentages of casein and albumin, which were supposed to be constant for each kind of milk. It has been stated with great confidence that there was one part of albumin to five parts of casein in cow's milk and two parts of albumin to one part of casein in human milk. Van Slyke, who has made an exhaustive study of this subject, found there was no fixed relation between casein and albumin. It varied in herd milk from 2.6 to 5.6 parts of casein to one part of albumin. The proportion is different in the various breeds of cows and in the individuals of the breeds, and it also is different at different seasons of the year. In two Jersey cows the proportions were 3.7 and 6.3 parts of casein to one of albumin, and in two Holstein-Friesian cows they were 3.2 and 4.4 to 1.

In addition to these wide fluctuations it should be remembered that caseins are not alike, so this basis has an insecure foundation to rest upon. In practice, when this theory is applied, a portion of the casein of the cow's milk is removed and alkali is added to the [illegible]g amount which throws it into the intestine for digestion.

These different methods of supposedly making human milk from cow's milk have all fallen under the heading of "modifying milk." As a matter of fact, none of the methods resulted in making human milk, and some of them were wide of the mark. Those who study the subject carefully will see that what actually takes place in all of the methods of feeding which have been proposed is an adaptation of the food to the infant by one means or another. Milk is *modified* by all methods, but the principles involved differ widely. The following classification will be found helpful:

Classification of Methods of Modifying Milk for Infant-feeding.—Any method of infant-feeding, no matter what theory it is founded upon, will fall naturally into one of the following groups. This classification will not only help the reader to understand any method of feeding which he has used, but will readily help him determine the principles involved in any new plan or method of feeding which may be proposed in pediatric literature.

GROUP 1. *Methods that affect the quantitative composition of cow's milk.*

(*a*) Simple dilution with water; (*b*) dilution with water with the addition of cream and sugar; (*c*) removal of a portion of the casein by adding rennin and then straining out the solidified casein or a portion of it.

GROUP 2. *Methods in which the character of the proteins of cow's milk are so altered that the rennin of the stomach will not solidify the milk.*

(*a*) Addition of lime-water until alkaline to phenolphthalein (5 to 10 per cent. of the *food*); (*b*) addition of carbonate of potassium until slightly alkaline (¼ grain to ounce of milk). If the stomach secretes enough acid to neutralize these additions the milk will solidify.

GROUP 3. *Methods that retard the solidification of milk by rennin and also neutralize any acid that may be secreted by the stomach.*

(*a*) Addition of 1 to 2 grains of bicarbonate of sodium to each ounce of food; (*b*) addition of syrup of lime; (*c*) addition of magnesium hydrate. These additions tend to prevent all gastric digestion and to throw the entire work of digestion on the intestines.

GROUP 4. *Methods in which the casein is precipitated in fine particles by acids.*

(*a*) Buttermilk feeding; (*b*) kumyss feeding; (*c*) matzoon feeding; (*d*) addition of dilute hydrochloric acid. In buttermilk feeding, lactic bacteria naturally in the milk, or those that may be added, are allowed to grow and produce lactic acid which precipitates the casein. If the buttermilk is boiled before feeding, as it is sometimes, the bacteria will be killed, otherwise bacteria are also given in enormous numbers which may sometimes prove beneficial. In kumyss and matzoon feeding, bacteria produce acid which precipitates the casein. Yeasts may also be present.

Any pepsin that may be secreted can readily act upon the proteins in the presence of the acids. Such foods may encourage gastric digestion.

GROUP 5. *Methods that profoundly alter the character of the milk.*

(*a*) Peptonization of milk; (*b*) addition of 1 to 2 grains of citrate of sodium or potassium to each ounce of milk employed.

Peptonization completely alters the character of the proteins of the milk. Casein is in some way combined with calcium in milk. Citrate of sodium or potassium when added to milk produce citrate of calcium and caseinate of sodium or potassium, which will not form a solid with rennin. The calcium citrate is soluble in an excess of the precipitant and remains in solution. Acids added to milk in which the casein is in combination with ammonium, sodium, potassium, or lithium will produce a precipitate of casein like that of sour milk. Peptonized milk also remains fluid in the stomach.

GROUP 6. *Methods that indirectly alter the properties of the milk.*

(*a*) Sterilizing, boiling, or scalding the milk; (*b*) pasteurizing the milk; (*c*) using condensed or evaporated milk.

Heating milk in some way changes it so the rennin ferment does not cause it to solidify as firmly or as promptly as does fresh milk, and it also destroys bacteria that might produce acid which would accelerate the action of the rennin in solidifying the milk.

GROUP 7. *Methods that mechanically alter the character of the solidified milk without affecting the action of the digestive secretions.*

(*a*) Diluting the milk with cereal gruels in which the starch is in a gelatinized condition; (*b*) diluting the milk with cereal gruels in which the starch has been converted into soluble starch, dextrin, and maltose.

Infants Tend to Adapt Themselves to Their Food.— One of the inherent faculties possessed by all forms of living things is the ability to change their form and functions, to bring themselves into harmony with new or altered conditions of life, if the altered conditions are brought about gradually. The acquirement of tolerance for drugs, and immunity to certain diseases after one infection are illustrations.

Similarly, the feeding or nutritional habits of animals can be modified to a greater or less extent. It is possible by careful management to develop in a carnivorous animal herbivorous habits of feeding. The one thing to be avoided in such feeding is too radical and too sudden changes in the form of the food, as the animal then does not have sufficient time to adapt itself to the new conditions.

In infants this ability of adaptation to the food is present to a marked degree, and much of the credit that goes to the successful feeder is due to the unconscious cooperation of the infant, brought about by making the changes in food gradually, giving it time to adapt itself to new food conditions. Those in which the power of adaptation is *dormant* form the greater number of the *difficult feeding cases.*

It is also due to this power of adaptation that some infants can survive and grow on food that would sicken ot' [illegible] There is a limit to this faculty, however, and it is more strongly developed in some infants than in others. When properly utilized it is of great assistance to the physician, but it should not be abused.

Infants Differ in Digestive and Assimilative Efficiency.— It has been often observed that some infants will thrive and gain in weight on an amount of nutriment that others of the same age fail to gain on, and that some infants gain in weight more rapidly on the same quantity of food than other infants do. This fact has been perplexing to many, and has led some to believe there was no science in infant-feeding, each infant being a law unto itself. But widely extended experiments on animals have shown that they differ greatly in their efficiency in appropriating and utilizing food, the organs of assimilation being nearly twice as efficient in some animals as in others of the same species.

Assimilation Most Efficient in Early Infancy.— The capacity for assimilation of food is not the same at all periods of growth. It is greatest during the early part of infancy and becomes gradually less as maturity is approached, until no matter how much food is eaten only the normal metabolic loss is made good, and fat is stored up, any excess of proteins being excreted. Young infants have been found to store up 70 per cent. of the proteins of their food, but in the adult as much nitrogen as is taken in as protein is excreted, so none is fixed as new tissue. Therefore a sufficient quantity of tissue-building food (protein) *early* in life is of the greatest importance from a point of economical use of food and for promoting vigorous growth. It is also important in another way, for at this period the digestive organs, liver, kidneys, and heart are developing rapidly, and the size and strength of these organs will depend upon the supply of building material available, which is protein.

If an infant has indigestion its food should be reduced to its digestive capacity, but no greater mistake is made in infant-feeding than to keep infants on food containing a small quantity of protein for any length of time, for as the infant becomes older, increasing the quantity in the food is offset by the lessened capacity of assimilation. Proper feeding in the first few weeks or months after birth insures good development and freedom from trouble later on. If an infant is badly fed during this formative period, its management later on may be a tedious and difficult matter.

CHAPTER XV.

PRACTICAL FEEDING.

Basis of Practical Feeding.— No matter how much the actual processes employed in preparing food for infants may differ, they all have for their object the combination of protein, mineral matter, fats, carbohydrates, and water in some form that will be acceptable to the infant. It has been shown that it is important for these ingredients to be present in the food in certain relative proportions if the infant is to develop properly, and with the least amount of waste of digestive and assimilative effort. It is likewise of importance to understand methods of calculating the quantities of the food elements in any food mixture, and how to determine the quantities of milk, cereals, sugar, and other materials necessary to use to produce different food mixtures containing any desired quantities of protein, mineral matter, fats, carbohydrates, and water. The best practice is to think of the percentage composition of the food, and many times the cause of a digestive disturbance in an infant can be determined by working out the approximate percentage composition of the food from the formula used in making it, when it may be found that one or more ingredients — that is the proteins, fats, or carbohydrates — are present either in excess or in too small quantity.

Percentage Milk Mixtures in Infant-feeding.— As was stated on page 110, the best milk to use in feeding infants is that produced under sanitary conditions, bottled at the dairy and kept iced until delivered to the family. When such milk is delivered the cream has risen and appears as a distinct layer at the top of the bottle. If the bottle of milk is shaken to mix its contents, the milk will then have a uniform composition which will almost always fall between the following extremes:

Fats	Carbohydrates	Protein	Mineral matter
3%–5%	4%–6%	3%–3.5%	0.6%–0.8%

To make simple approximate calculation of the quantities of these elements that cow's milk imparts to a mixture, it is best to take the mean composition of commercial cow's milk as a working basis, especially as a large part of the bottled milk has about this composition. If milk above this mean is used the error cannot be great, and if below the error will also be small. For this reason it is advisable to take as a working basis the following figures:

Fats	Carbohydrates	Protein	Mineral matter
4%	5%	3.2%	0.7%

NOTE.— At one time the figures proteins 4%, fat 4%, and carbohydrates 4% were used but as the error in proteins was about 25% they are not being used so much. Some still take the protein as 3.5%, but this is rather high for the general run of milk.

If a feeding mixture contains one-fourth milk, the quantities of the food elements supplied by the milk will be one-fourth of the foregoing figures or:

	Fats	Carbohydrates	Proteins	Mineral Matter
4	4%	5%	3.2%	0.7%
	1%	1.25%	0.80%	0.18%

If the proportion of milk in the food was one-third, one-half, one-tenth, or any other fraction, the composition of the food would be determined in the same manner.

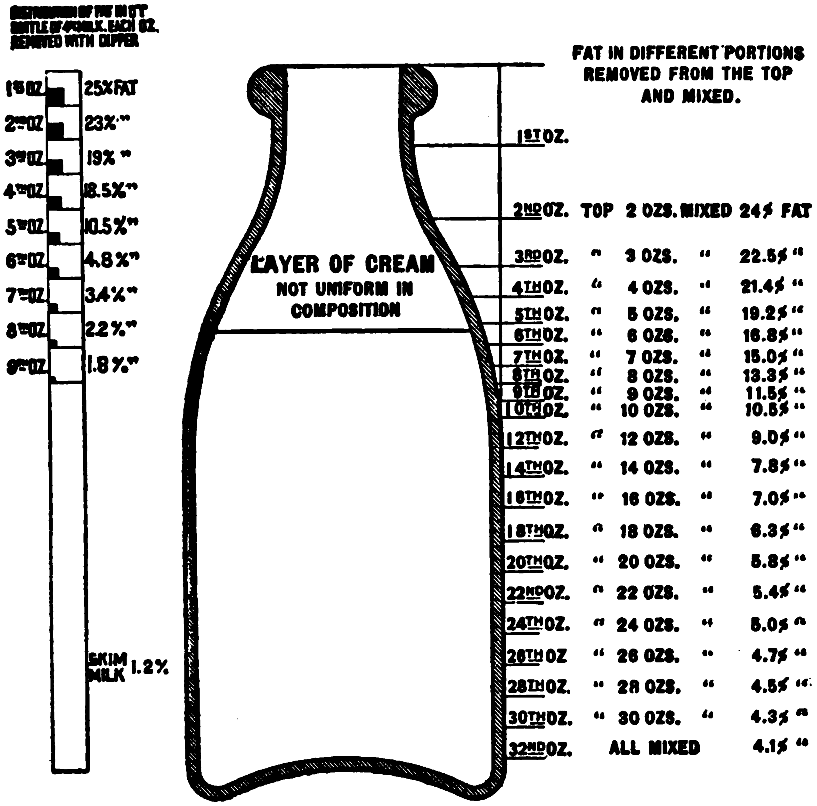
DISTRIBUTION OF FAT IN QT.
BOTTLE OF 4% MILK. EACH OZ.
REMOVED WITH DIPPER
1st OZ. 25% FAT
2nd OZ. 23% "
3rd OZ. 19% "
4th OZ. 18.5% "
5th OZ. 10.5% "
6th OZ. 4.8% "
7th OZ. 3.4% "
8th OZ. 2.2% "
9th OZ. 1.8% "
SKIM MILK 1.2%
LAYER OF CREAM
NOT UNIFORM IN COMPOSITION
FAT IN DIFFERENT PORTIONS REMOVED FROM THE TOP AND MIXED.
1ST OZ.
2ND OZ. TOP 2 OZS. MIXED 24% FAT
3RD OZ. " 3 OZS. " 22.5% "
4TH OZ. " 4 OZS. " 21.4% "
5TH OZ. " 5 OZS. " 19.2% "
6TH OZ. " 6 OZS. " 16.8% "
7TH OZ. " 7 OZS. " 15.0% "
8TH OZ. " 8 OZS. " 13.3% "
9TH OZ. " 9 OZS. " 11.5% "
10TH OZ. " 10 OZS. " 10.5% "
12TH OZ. " 12 OZS. " 9.0% "
14TH OZ. " 14 OZS. " 7.8% "
16TH OZ. " 16 OZS. " 7.0% "
18TH OZ. " 18 OZS. " 6.3% "
20TH OZ. " 20 OZS. " 5.8% "
22ND OZ. " 22 OZS. " 5.4% "
24TH OZ. " 24 OZS. " 5.0% "
26TH OZ " 26 OZS. " 4.7% "
28TH OZ. " 28 OZS. " 4.5% "
30TH OZ. " 30 OZS. " 4.3% "
32ND OZ. ALL MIXED 4.1% "

FIG. 39.— Percentages of fat in different portions of a quart bottle of milk.

Top Milk.— When whole milk is diluted for infant-feeding the proportion of fat in the diluted milk may fall below the requirements, as also the quantity of sugar or carbohydrates, so it may be necessary to add these elements. The quantity of protein in cow's milk is too great for most infants to digest, and more than they require for growth, and therefore it is to reduce the quantity of proteins that the milk is diluted.

Formerly the addition of cream to diluted milk was a favorite method of adding fat, as it is essentially milk extra rich in fat, the protein and carbohydrates being present in but slightly less quantities than are found in whole milk. However, several objectionable properties of cream make its use inadvisable. First, its composition is not uniform, and then it may be old and heavily laden with bacteria which will infect any sanitary milk it may be mixed with; and, again, it may have been passed through a centrifuge, and had its natural emulsion destroyed (see page 113), so that it becomes more oily. In addition to these material objections, it is a difficult matter for many to calculate the composition of food made with cream and milk, and great errors in the composition of the food result from mistakes in the arithmetical process, the infants often suffering from the improper food.

These drawbacks to the use of cream have caused this method of adding fat to the infant's food mixture to be largely supplanted by the top-milk method, which is simple and accurate.

As was stated above, when milk is bottled and kept cool the cream rises to the top of the bottle and forms a distinct layer. This cream contains nearly all of the fat of the milk, the milk under the cream layer often containing only 0.4 per cent. of fat, while the cream at certain levels may contain as high as 25 per cent. of fat. The layer of cream is not uniform in composition, as will be seen by the illustration of the amount of fat in each ounce removed from the top of a quart of milk containing 4 per cent. of fat even on which the cream had not completely risen, as is shown by the high percentage of fat in the milk under the cream layer.

At one time it was believed that cream which rose of its own accord, and known as gravity cream, was uniform and contained but 16 per cent. of fat; and as very often the cream to be added to the infant's food was taken directly from the mouth of a quart bottle, instead of the infant getting 16 per cent. fat cream, one containing 25 per cent. or more of fat was obtained. A common thing was to see infants suffering from fat indigestion caused by an excess of fat thus unwittingly introduced into the food.

It is evident that if all of the fat of a quart of whole milk containing 4 per cent. of fat rose to the surface, the top or upper pint, or one-half of the quart of milk, would contain twice the percentage of fat in the original milk, or 8 per cent., while the remaining pint would contain no fat at all. If all of the fat was in the top one-third of the quart of milk it would contain three times 4 per cent. or 12 per cent. of fat.

As a matter of fact, nearly all of the fat in a quart of milk is found in the top six to eight ounces after the cream has risen, so by taking all of this layer of cream with some of the fat-free milk underneath, milk containing 1½, 2, 3, or any other number of times as great a percentage of fat as the whole milk contained may be had from the ordinary quart bottle of milk. As a small percentage of fat remains in the milk below the cream, a little less than the above theoretical quantities are removed from the top of the bottle.

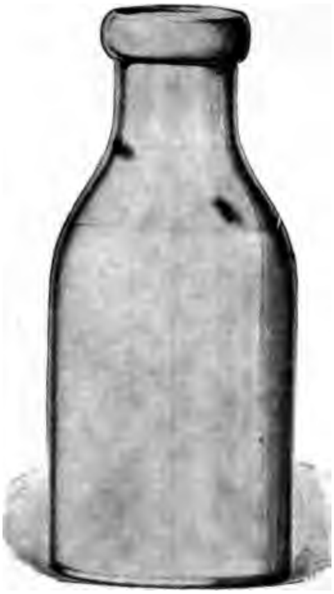

FIG. 40.— Quart bottle of milk, showing layer of cream.

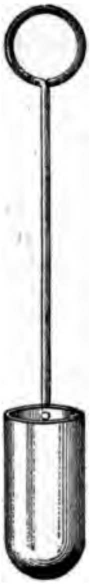

FIG. 41.— Chapin cream dipper.

These top milks, as they are called, contain about the same quantities of protein, mineral matter, and carbohydrates as whole milk, so when using whole milk or top milks for dilution the percentages of all the elements except the fat will be the same no matter which is diluted. Therefore, by using definite quantities of the upper part of a quart of milk after the cream has risen the amount of fat in the diluted milk can readily be varied, while the percentages of the other elements remain unchanged. For example, there could be obtained top milks containing

Fat	Carbohydrates	Protein
6%	5%	3.2%
8%	5%	3.2%
12%	5%	3.2%

And if each was diluted four times the diluted milk would contain percentages equal to one-fourth of these figures, or

Fat	Carbohydrates	Protein
1.5%	1.25%	.80%
2.0%	1.25%	.80%
3.0%	1.25%	.80%

The percentages of the elements in any dilution can readily be determined in the same manner.

To obtain these different top milks the dipper[1] shown in Fig. 41 is used. It measures one ounce.

Percentage Cereal Gruels.— Until comparatively recently the use of cereal gruels has been purely empirical, and little attention has been paid to their composition or nutritive value. But recognition of the benefits to be derived from their intelligent employment is leading to their being used in a scientific manner, and the tendency is to prescribe them in definite quantities and of approximately definite percentage composition. The composition of cereal gruels depends upon the cereal employed in making them and also to a much greater extent upon the condition of the cereal, that is, whether it is in the form of flour, granulated, or in the whole state. If flour is used in making the gruel and none is removed by straining, dividing the composition of the flour by the number of parts of gruel made from one part of flour will give its composition: as, for instance, a gruel made with one ounce of flour to the pint would be one-sixteenth as strong as the flour. But when whole or granulated cereals are used, a large part of the proteins and considerable of the carbohydrates are removed by straining, as the cereal does not disintegrate while cooking and the composition of the gruel is not in proportion to the composition of the cereal employed.

In using ordinary cereals in preparing gruels the following quantities will be approximated, when a tablespoon is used in measuring the cereals.

1 level tablespoonful of pearl barley weighs ½ oz. avoirdupois.
1 level tablespoonful of barley flour weighs ¼ oz. avoirdupois.
1 level tablespoonful of wheat flour weighs ¼ oz. avoirdupois.
1 level tablespoonful of rolled oats weighs ¼ oz. avoirdupois.

If all of the rolled oats had remained in the gruel made with one ounce to the quart, the gruel would have contained about 0.50 per cent. proteins, as these rolled oats contained about 16 per cent. proteins, but the gruel actually contained but 0.26 per cent. proteins, showing half the proteins were removed when the gruel was strained.

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[1] It is known as the Chapin Dipper and is sold through the wholesale druggists. It can be obtained by mail of Cereo Company, Tappan, N. Y.; also from Jas. T. Dougherty, 411 West Fifty-ninth St., New York.

Key to Milk and Water Percentages.

	Protein	The percentage of fat obtained will depend on what kind of milk is used, as follows:					
		1	2	3	4	5	6
If the proportion of milk or top milk in the feeding mixture is	The percentage of protein will be	By using 4% milk or whole milk	By using 5% milk or the top 24 oz. from 1 qt.	By using 6% milk or the top 20 oz. from 1 qt.	By using 7% milk or the top 16 oz. from 1 qt.	By using 10% milk or the top 11 oz. from 1 qt.	By using 12% milk or the top 9 oz. from 1 qt.
one-eighth	.40%	.50%	.62%	.75%	.88%	1.3%	1.5%
one-quarter	.80%	1.0 %	1.2 %	1.5 %	1.7 %	2.5%	3.0%
three-eighths	1.2 %	1.5 %	1.8 %	2.2 %	2.6 %	3.7%	4.5%
one-half	1.6 %	2.0 %	2.5 %	3.0 %	3.5 %	5.0%	6.0%
five-eighths	2.0 %	2.5 %	3.0 %	3.7 %	4.4 %	6.2%	7.5%
three-quarters	2.4 %	3.0 %	3.7 %	4.5 %	5.2 %	7.5%	9.0%
seven-eighths	2.8 %	3.5 %	4.4 %	5.2 %	6.0 %	8.6%	10.4%

SUGAR.

The amount of sugar in the diluted milk will about equal the percentage of protein.

1/50 of the mixture = 2%
1/33 of the mixture = 3%
1/25 of the mixture = 4%
1/20 of the mixture = 5%
1/16 of the mixture = 6%
2 level tablespoonfuls granulated sugar = 1 oz.
3 level tablespoonfuls milk-sugar = 1 oz.

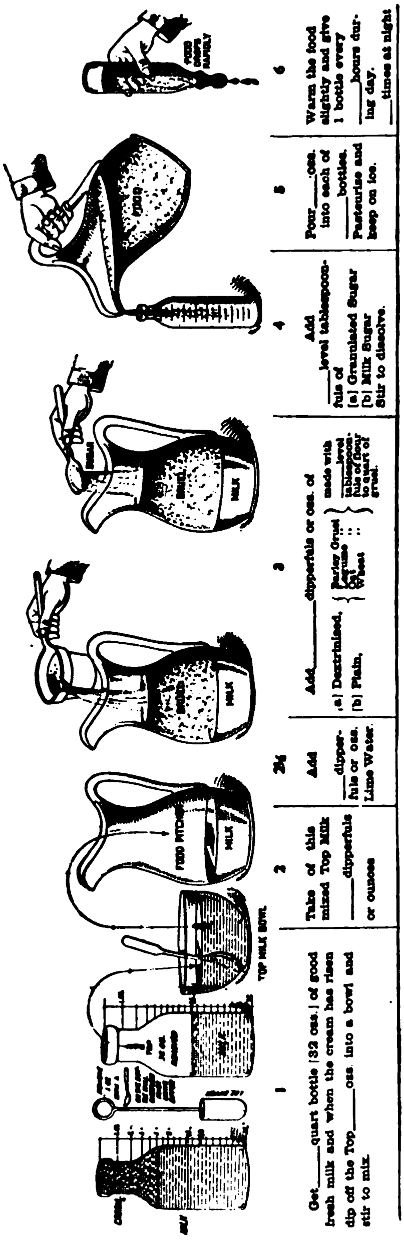
Outline of Feeding Directions.—It is impossible to give explicit directions for preparing food for each particular infant, as infants differ in their digestive capacity, in their efficiency in assimilating food, and in their condition when the physician is called in. However, all cases naturally fall under about four headings: (*a*) Well infants which cannot obtain breast-milk, and the control of which the physician has from the start. (*b*) Infants that are well except that they are suffering from bad methods of feeding. (*c*) Infants of feeble constitution whose digestion is easily deranged. (*d*) Infants that are acutely ill. Before attempting to feed an infant, its feeding history should be carefully taken to determine in which class the infant belongs.

The methods of feeding these different classes of infants vary considerably, and while the same general principles hold, they must be applied differently. In all methods attention must be paid to percentage composition of the food. This is not a difficult matter, and can be readliy learned, but the skill and ability of the infant feeder have a chance for display when it comes to adapting the *form* of the protein, fats, and carbohydrates to the infant; or to modifying the action of the infant's digestive secretions on its food by various additions to the food as explained on page 123. In the suggestive feeding mixtures given here the preparation of the food is sharply divided into two parts: First, adjustment of the quantitative or percentage composition. Second, modification of the form of the food, or the action of the digestive secretions on the food.

Food for Healthy Infants.

The object in preparing food for healthy infants is to so modify or adapt the food that they will be well nourished and have their digestive organs so developed that the infants will become able to take whole cow's milk without digestive disturbance. It is generally about the ninth to twelfth month before this is possible, and if alkalies or antacids have been added to the food in too great quantities it may be later, as these substances seem to interfere with the normal development of the stomach.

In reality the whole process amounts to a training of the infant's digestive organs, and it is important to commence in the early months with small quantities of the protein of cow's milk, as this causes the greatest amount of trouble, moderate quantities of fat, and a liberal supply of carbohydrates, as these cause little digestive disturbance when not given in too great excess. The fats are kept in the neighborhood of 2-3 per cent. during the whole period of artificial feeding, and the carbohydrates at about 6 per cent. or 7 per cent., seldo[illegible] these figures. But the protein is managed in an entirely diffe[illegible] t first the protein is given in as small a quantity as 0.4 per cent., or about one-eighth as much as is found in cow's milk and about one-fourth as much as in breast milk. As soon as a tolerance is established the quantity is increased about 0.40 per cent. at a time until the infant is able to digest whole milk with its 3.20 per cent. of protein. These advances in strength of food are made about a month apart. There is no fixed rule, except to increase as rapidly as the infant can stand it. With some the advance can be quite rapid, while with others it must be made slowly.



1 Get____quart bottle (32 ozs.) of good fresh milk and when the cream has risen dip off the Top____ozs. into a bowl and stir to mix.

2 Take of this mixed Top Milk ____dipperfuls or ounces

2½ Add ____dipperfuls or ozs. Lime Water.

3 Add____dipperfuls or ozs. of (a) Dextrinized, (b) Plain, {Barley Gruel, [illegible], Oat, Wheat} made with ____level tablespoonfuls of flour to quart of gruel.

4 Add ____level tablespoonfuls of (a) Granulated Sugar (b) Milk Sugar Stir to dissolve.

5 Pour____ozs. into each of ____bottles. Pasteurize and keep on ice.

6 Warm the food slightly and give 1 bottle every ____hours during day. ____times at night

FIG. 42.

By this process the heat and energy portions of the food are kept up to the highest point of efficiency, while the growth-producing elements are at first given in less quantities than is desirable; but gradually they are brought up to a point where proper tissue formation becomes possible. If the protein is given in too great quantities at first, indigestion results and a period of greater or less duration ensues in which little growth can be made. For this reason it is better in the long run to slightly underfeed with protein for a short time and avoid digestive disturbances. In increasing the quantity of protein in the food it is often the case that the more the haste the less the speed.

The following table gives an outline of the quantities and composition of food which may be taken as a working basis in preparing food for healthy infants by the top milk method.

Suggestive Feeding Table.

Age	Quantity of food	Number and size of feedings for 24 hours	Feeding intervals	Approximate percentage composition			How to make food		A	or	B	
				Protein	Fat	Carbohydrates	Remove from one quart of milk	Use of this	Add boiled water	Add sugar	Add gruel, 1 oz. flour, to qt.	Add sugar
1-6 days.	20 ozs.	9-2 ozs.	2 hours, twice at night.	.40%	1.5%	6.0%	Top 9 ozs.	2½ ozs.	17½ozs	1 oz.	17½ ozs.	½ oz.
2-4 weeks.	28 ozs.	9-2 to 3 ozs.	2 hours, twice at night.	.80%	3.0%	7.0%	Top 9 ozs.	7 ozs.	21 ozs.	2 ozs.	21 ozs.	1 oz.
2d month.	32 ozs.	7-3 to 4 ozs.	2½ hours, once at night.	1.20%	2.6%	7.0%	Top 16 ozs.	12 ozs.	20 ozs.	1½ ozs.	20 ozs.	1 oz.
3d month.	32 ozs.	7-4 ozs.	2½ to 3 hours, once at night.	1.60%	3.0%	7.0%	Top 20 ozs.	16 ozs.	16 ozs.	1½ ozs.	16 ozs.	1 oz.
h to 6th month.	40 ozs.	6-4 to 6 ozs.	3 hours, once at night.	2.00%	3.0%	7.0%	Top 24 ozs.	24 ozs.	16 ozs.	1½ ozs.	16 ozs.	1 oz.
th to 9th month.	48 ozs.	6-6 to 8 ozs.	3 hours, during day.	2.40%	3.0%	7.0%	Use whole milk.	36 ozs.	12 ozs.	1½ ozs.	12 ozs.	1½ ozs.
10th to 12th month.	48 ozs.	5-8 to 10 ozs.	3½ hours, during day.	2.80%	3.5%	7.0%	Use whole milk.	42 ozs.	6 ozs.	1½ ozs.	6 ozs.	1½ ozs.
12th to 14th month.	48 ozs.	5-8 to 10 ozs.	3½ hours, during day.	3.20%	4.0%	7.0%	whole milk.	......	......	......	....	......

2 level tablespoonfuls granulated sugar = 1 oz
3 level tablespoonfuls milk-sugar = 1 oz.

It will be noticed in the feeding table that less sugar is to be added to the food when gruel is used than when water diluent is employed. This is because the gruel contains considerable carbohydrates. A convenient rule to remember is, when gruels made with one ounce of flour to the quart are used, add 3 per cent. of sugar; and when two ounces of flour to the quart are employed, add 2 per cent. of sugar. These additions would be one thirty-third and one-fiftieth of the total quantity of the food, respectively. These proportions will always make the percentage of carbohydrates in the food between 6 and 8 per cent.

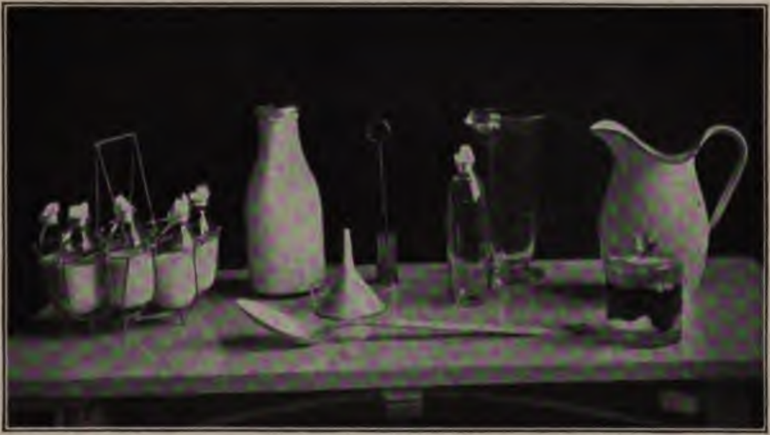


FIG. 43.— Simple utensils for home modification.

A rule often employed for adding sugar to food is, add 5 per cent. or one part to twenty parts of food. This will always make the percentage of carbohydrates fall between 5.5 per cent. and 9.5 per cent. when water diluent is used and much higher when gruel diluent is employed. One part of sugar to twenty-five parts of food makes the percentage of carbohydrates fall between 5 per cent. and 8 per cent. when water diluent is used.

When gruels are used to dilute the milk the percentages of protein in the mixtures will be greater than those given in the feeding table which are for milk and water mixtures. The protein added by the gruel not only increases the tissue-building value of the mixtures, but acts as a mechanical diluent or softener of the solid formed from the protein of the cow's milk, and hence makes it more digestible. As the value of gruels when used intelligently has become better appreciated, they have come to be employed more and more, and whenever they are tolerated they should be used in preference to water for diluting the milk. Two kinds of gruels are employed: (*a*) those made by boiling the cereal in water, which contain starch in an unchanged condition; (*b*) those to which an agent for changing the starch into dextrin and maltose is added. Gruels so made are called, respectively, *plain gruels* and *dextrinized gruels.* Dextrinized gruels should be used for young infants and when plain gruels are not well borne.

Directions for Making Gruels.— Stir from one to four level tablespoonfuls of the cereal flour into one quart of cold water to avoid the formation of lumps. Place the mixed flour and water into a double boiler (Fig. 44) and with constant stirring bring to a boil. This will cause the flour to swell up owing to the gelatinization of the starch. Now allow the gruel to boil for fifteen minutes. Stirring will not be necessary. If an open kettle is used the gruel may burn at the bottom and impart a bad taste to the food. If the gruel is to be used plain, strain through a fine wire strainer and add enough boiled water to make one quart of gruel. If it is to be dextrinized set the cooker into cold water for two or three minutes and when the gruel is cool enough to taste add a teaspoonful of some preparation of diastase. A decoction of diastase may be made at home by covering a tablespoonful of crushed malted barley grains by a little cold water and placing the mixture in the refrigerator over night. In the morning the water that is strained off will be active in diastase, but will not keep long. A glycerite of diastase known as Cereo is now made for this purpose, and has proven to be reliable. Stir and the gruel will become thinner as the starch goes into solution and forms dextrin and maltose. Strain and add enough boiled water to make one quart of gruel. The flocculent matter in the gruel is mostly protein. No matter which kind of gruel is employed it should be cooled and kept on ice until ready to be mixed with the milk.

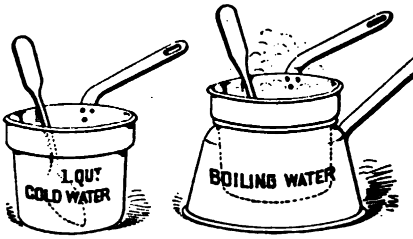


FIG. 44.— Double boiler.

Approximate Home Modification of Whole Milk.

Since there are some localities in which bottled milk is not obtainable, it is well for the practitioner to know how he can approximately modify the milk when he can only assure himself that the supply is wholesome and obtained under cleanly precautions.

In many isolated farming districts bottled milk is out of the question, and it is impracticable to have it delivered in bottles. Special utensils as the Chapin dipper are not ready at hand or the mother may be deemed too unintelligent to use them correctly.

The principles of percentage feeding can sometimes be carried out and good results obtained by using very simple measures. This we have demonstrated to our satisfaction in our City Milk Depots where mothers in the tenements have been taught to modify whole milk with success as far as the health and growth of their infants was concerned.

We have never believed that success depended upon fractional percentages but rather upon percentages approximately correct made up with a pure wholesome milk and fed to a baby that is kept under the proper hygienic conditions as outlined in Chapter IV.

The physician should be careful to select a milk from a mixed herd of cows and if possible avoid a milk apt to be too rich in fats, such as would be obtained from Jersey cows. If there is any question as to the richness, an examination can be made, at the nearest creamery, of the fat content and computations can then be based on this analysis.

The average whole milk will contain fat, 4 per cent.; sugar, 4 per cent.; protein, 3.2 per cent. If such a milk is diluted four times, that is, one part milk and three of diluent, we will have

Fat.	Sugar.	Protein.
4 | 4	4	3.2
1	1	0.8

1 per cent. fat, 1 per cent. sugar, and 0.8 per cent. protein in the mixture, which needs but the addition of sugar to make a suitable food for the newborn. The quantity and time of feeding will be found on page 134. Enough sugar is added to make 6 per cent.; the amount is easily calculated if it is recollected that 1 ounce of cane sugar to every 20 ounces of the food will add 5 per cent.

Similarly if a dilution of three parts is made, that is, one part milk and two of diluent, we would have fat 1 1/3 per cent., sugar 1 1/3 per cent., protein 1 per cent., and again if the whole milk is diluted once, we have fat 2 per cent., sugar 2 per cent., protein 1.6 per cent. If three parts of milk are in the mixture and one of diluent, its composition will be fat 3 per cent., sugar 3 per cent., protein 2.4 per cent.

If there is any question as to the cleanliness of the milk or the healthfulness of the cows, the milk may be pasteurized, especially in hot weather, if refrigeration is not available.

The following are simple modifications of raw whole milk made up with water or barley gruel and reduced to the quantity to be taken at each feeding.

Baby three days to two weeks old, feed every two hours.

Milk, 1 tablespoonful.
Water or barley water, 3 tablespoonfuls.
Sugar, half a teaspoonful.

Baby, two weeks to three months, feed seven to eight feedings every two hours.

Milk, 2 tablespoonfuls.
Water or barley water, 4 tablespoonfuls.
Sugar, 1 teaspoonful.

Baby three to six months old.

Milk, 6 tablespoonfuls.
Barley water, 6 tablespoonfuls.
Sugar, 2 teaspoonfuls.
Six such feedings in the twenty-four hours.

Baby six to nine months old.

Milk, 12 tablespoonfuls.
Barley water, 6 tablespoonfuls.
Sugar, 2 teaspoonfuls.
Give five such feedings in the twenty-four hours.

Baby nine to twelve months old.

Milk, 16 tablespoonfuls.
Barley water, 4 tablespoonfuls.
Sugar, 2 teaspoonfuls.
Give five such feedings in the twenty-four hours.

Adaptation of Food to Infant.— So far the directions have had to do only with bringing together the food elements in quantities capable of producing proper growth and development at different ages. But this is a small part of practical infant-feeding, for any one of the foregoing mixtures may not agree with the infant. The problem then becomes how to adapt the food so that it will agree with the particular infant. Adaptation may be accomplished in a number of ways, as follows, beginning with simple changes in the food and ending in methods that are more complex in their effects:

SYMPTOMS.— The infant has no digestive disturbances, except slight constipation and scanty stools, but does not gain in weight.

What to Do.— Increase the strength of the food by using the next higher formula.

SYMPTOMS.— The infant vomits, some time after taking its food, rancid-smelling material; its stools are soft and contain small flecks or white particles.

What to Do.— Reduce the amount of fat in the food by using weaker top milk or plain milk in making the food. In extreme cases use skimmed milk in making the mixture and add a pinch of bicarbonate of sodium to each feeding.

SYMPTOMS.— The infant's stools are inclined to be too soft, but otherwise it seems to be doing well.

What to Do.— Use barley or wheat in making gruels, and if necsesary use weaker top milk to reduce fat, which may be excessive.

SYMPTOMS.— The infant is doing well with the exception of being more or less constipated.

What to Do.— Use oat gruel for diluting the milk as it has a laxative effect, and increase the fat in the food to 3.5 per cent. to 4 per cent. by using richer top milk. Give boiled water between feedings.

SYMPTOMS.— The infant suffers from colic, but has no curds in the stools.

What to Do.— Change the form of cereal gruel employed, and dextrinize, if plain gruel has been used. That is, if oat gruel has been used, try barley or wheat gruel which has been dextrinized in its place. Pasteurize the food temporarily.

SYMPTOMS.— The infant has colic with more or less curdy stools.

What to Do.— If water has been used in making the food mixture, try plain or dextrinized barley or wheat gruel instead and pasteurize temporarily. If this does not overcome the difficulty, add one to two tablespoonfuls of lime-water to each feeding bottle; or add one to three grains of citrate of sodium; or add two to ten grains of bicarbonate of sodium to each feeding bottle. The effect of these additions will be found at page 124. The citrate of sodium or bicarbonate of sodium should not be added for long periods, as they interfere with normal digestive development.

SYMPTOMS.— The infant has sour, watery stools.

What to Do.— Reduce the quantity of sugar in the food, as it is fermenting, and also change the form in which it is given. If granulated sugar is being used, try milk sugar. If dextrinized gruels are being employed try plain gruels. Pasteurize. In any event change the form of the carbohydrates.

Food for Infants Previously Badly Fed.

Feeding History.— These cases almost invariably have a history of being well nourished at birth, and perhaps of doing well at the breast until for some reason substitute feeding became necessary, when contaminated milk, improper modifications of milk, or proprietary infant foods were tried at random, and many or few changes in the food were made as method after method failed. These infants may not have gained in weight, or if they have gained in weight the flesh produced has been fatty, caused by high carbohydrates in the food with low protein. They may be suffering from incipient rickets, or show signs of scurvy, and in severe protracted cases may have drifted into marasmus. Many cases not so severe simply show a loss of weight with the infants in a fair condition.

Management.— When seen early this is the simplest class of cases the physician is called upon to treat dietetically, and with careful management they promptly respond to treatment, but when the bad feeding has been prolonged the cases are often difficult and tedious. One of the greatest aids is to work out the composition of food previously given, and to consider the methods of adapting the food that may have been used, such as addition of lime-water, bicarbonate of sodium, citrate of sodium, etc. It is of material assistance to know what has failed and whether failure followed a method properly carried out or whether it followed incorrect application of correct principles. In this connection it may be stated again that the physician should understand every detail of the preparation of food by all methods, be able to make gruels, should know the physical properties of food prepared in different ways, and also be acquainted with their taste and flavor. Barley gruel has a slightly bitter taste, oat gruel has a distinctive flavor, as has also legume and wheat gruel. A gruel that has been cooked in a stew pan often has a scorched taste which is sometimes very repulsive. The food may have been kept in a warm place or in a poor refrigerator, or the milk may have been stale or it may have been partially soured. Occasionally it may be found the proper top milk is not being used. These are a few suggestions which show that no detail of preparing the food should be overlooked or unknown to the physician.

For mild cases putting the infant on a formula similar to one given on page 134 for healthy infants of the same age will be all that is necessary, although a very good plan to follow is to give the food for a younger infant for a few days and if it agrees a stronger formula may then be ordered.

In more troublesome cases the digestive organs must be given a rest, either complete or partial, that is, no food at all must be given for a few hours, or the infant must be given not much more than enough food to keep it from living on its own tissues.

The following food mixtures may be tried, using whichever agrees best or can be prepared to best advantage, taking into consideration the probabilities of directions being carried out properly.

Dextrinized barley, legume, oat or wheat gruel, made with one to two ounces of flour (four or eight level tablespoonfuls) to the quart of gruel, directions for preparing which will be found on page 136, or whey made as follows may be used:

Directions for Making Whey.— From a quart of milk remove all of the cream. Then add to the skimmed milk a tablespoonful of liquid rennet or one junket tablet such as may be had at grocery stores. Place the milk in a double boiler (see page 136), and warm slowly. When the milk has solidified or "set" cut it in all directions into small pieces to allow the whey to escape. Now warm up to about 150° F., and stir while doing so. The curd which was all broken up will cohere into one or more large pieces which may readily be removed, and about twenty ounces of clear whey will remain. If the whey is heated above 160° F. the albumin will coagulate. The whey should now be cooled and kept on ice until ready to be fed. Its composition will be about, protein 0.80 per cent., fat 0.30 per cent., carbohydrates 5 per cent.

Whey and Cream Mixtures.— In some cases mixtures of whey and cream are tolerated better than other forms of food. They may be conveniently made as follows:

From one quart bottle of fresh milk remove with the dipper the top 6 ounces. Place the remaining 26 ounces in a double boiler, add a teaspoonful of liquid rennet and warm slowly. When the curd has become firm, cut it into small pieces with a knife and slowly bring to 150° F. Strain through a fine wire strainer, or cheese-cloth, and cool the whey.

By combining the whey and the top six ounces removed from the quart milk bottle a great variety of mixtures may be obtained as follows:

Use of the top 6 ozs.	Use of the whey	Approximate Composition		
		Protein	Fat	Carbohydrates
1 oz.	15 ozs.	.80%	1 %	5%
2 ozs.	14 ozs.	1.00%	2.5%	5%
3 ozs.	13 ozs.	1.20%	3.3%	5%

The quantities to be given are a little less than the amount of food that would be appropriate for a well infant of the same age. If any of these foods are well borne, milk may be added, a teaspoonful to a feeding, to see if it will be tolerated, and if so a weak milk mixture may be given and the strength of the food increased by degrees until full strength for the age is reached. If rickets or scurvy is present, more care in treatment will be necessary, and this must be according to lines laid down under these titles.

Food for Infants of Feeble Constitution.

This is one of the most difficult classes of infants the physician has to feed, and they often tax his ingenuity to the utmost. They are generally the offspring of nervous parents and are easily thrown out of equilibrium. They catch cold easily and are subject to attacks of indigestion from trivial causes. During the warmer months they are readily attacked by gastroenteritis, and their management then becomes tedious and their progress is slow, careful watching of the feeding being necessary at all times.

Whenever possible a wet-nurse should be obtained for these cases. Artificial feeding is unnatural in all cases, and while it may succeed in a majority of instances, its success is due not so much to the superior character of the food as to the infant's ability to adapt itself to its new food. This power of adapting to environment is feeble in these infants of unstable constitution, and too much dependence should not be placed upon it. Valuable time and strength should not be wasted in attempts at finding a food that will agree with the infant when it is possible to secure a wet-nurse.

A Wet-nurse Unobtainable.— When the services of a suitable wet-nurse cannot be had, substitute feeding must be tried, and methods that at one time would have been looked upon as quite unscientific are the ones most likely to give good results. One should not approach these cases with fixed ideas of what they ought to take and keep on with food that is evidently disagreeing. All of the infants must have protein, mineral matter, fats, carbohydrates, and water, and in this class of cases it is perfectly justifiable to supply them in any form that is acceptable to the infant. Of course, this statement is not to be construed as meaning any nostrum that may be suggested should be tried, but a combination of the food elements that is quite unlike either human milk or cow's milk in general composition or physical properties, such as given on page 144, may be offered. The point to bear in mind in the management of these cases is to keep the infants alive and as rapidly as possible build up their strength, and when this is done place them on a more natural diet.

There is more to feeding than combining food elements in certain more or less definite proportions. A subtle factor in managing these difficult cases is the arousing of the dormant powers of digestion and assimilation of the infants. This is often accomplished by a change in the flavor, taste, or physical condition of the food and in the form in which some of the elements are supplied. (See catalysers, p. 143.) So simple a change as substituting dextrinized gruel for plain gruel of the same strength, in a modified milk mixture, has sometimes had a good effect. The use of cooked foods, meat-broths, or other forms of food, such as egg mixtures or legume gruels, has also brought about sudden and permanent improvement. Chemical analysis does not show what there is about the food that produces such changes in digestion and assimilation, but that different forms of food do have different effects on different individuals is an undeniable fact, well known to animal feeders, who find that by catering to the idiosyncrasies of individual animals, much better assimilation is brought about, and more economical use is made of the food. This comes under the head, or in the same class, as the fact that food served to an adult in an attractive, appetizing manner will be digested much better than if it is served in an unattractive, repulsive condition.

Catalysers.

That a mere change in the flavor or form of food oftentimes produces a remarkable improvement in the assimilation of nourishment has long been known to investigators in the field of animal nutrition, as well as to many physicians, and the most striking results in difficult infant-feeding cases have come from the application of this principle although this fact has not always been recognized.

Until recently, however, there has been no satisfactory explanation of this phenomenon, but experiments made to discover simpler processes of manufacturing certain chemical products, which could only be obtained by indirect methods, have brought to light a factor in chemistry whose importance hitherto had not been suspected, and which explains this peculiar effect on assimilation of a change in the form and flavor of foods.

An illustration from actual experience will make the matter clear. It has long been known that certain chemical products can not be produced by merely bringing together their constituents in proper proportions. A mixture having the same chemical composition as the desired product can be obtained but no chemical combination is produced. However, the presence of some extraneous substance may cause the chemical combination to take place, although this substance does not enter into the combination; remains unchanged, and can be used repeatedly for this purpose.

Such substances are known as catalysers and a quantity so small as to be not detectable by chemical analysis is oftentimes all that is needed to cause certain chemical combinations to take place that would not occur in their absence. Now, these catalysers may become poisoned and lose their efficiency, and then either a new supply of the same catalysers must be had or a different one must be employed, for different substances may have the power to cause the same chemical combination to take place.

After foods have been digested they must be absorbed and then combined chemically to form the tissues. The materials necessary to form the tissues are well known, but how to make them combine is not known. There are undoubtedly catalysers in the organism which cause the chemical combinations to take place and malnutrition is probably the result of their absence or of their being poisoned. A change in the character of the food may stimulate their production or present forms of food that they can cause to combine. The remarkable results obtained in industrial chemistry with catalysers in producing substances which have heretofore been obtainable only by the action of living substances, seems to indicate that catalysts play a great part in nutrition.

Food for the Acutely Ill.

Classification of Cases.— Under the heading of Acutely Ill it is intended to group only those whose illness is reflected in disturbances of the digestive organs or by general malnutrition. Infants may be acutely ill with pneumonia or other infections and still not show special derangement of the nutritional functions. Again, as in gastroenteritis, there is an infection or intoxication which calls for more than dietetic treatment, so such cases will be treated under their respective titles.

Management of Cases.— In all of these cases it is of first importance to find something that will be retained, and before time is wasted in calculating a theoretically indicated mixture which may be rejected, it will be best to try some of the following mixtures, which if retained, will serve as a starting-point in working up to a suitable food mixture.

1. **Dextrinized barley, legume, oat or wheat gruel** made with one ounce of flour to the quart, as directed on page 136. If any one of these gruels agrees, the strength may be increased to two ounces of flour to the quart. Such gruels will contain about 0.80 per cent. protein and 5 per cent. carbohydrates, except the legume gruel, which will contain about 1.5 per cent. proteins with about 5 per cent. carbohydrates.

2. **Whey,** made as directed on page 141, may be tried, which will contain about the same quantities of protein and carbohydrates as the gruels made with two ounces of flour to the quart.

3. **The white of one egg beaten up in eight ounces of water** may be retained when nothing else is tolerated. Such a mixture contains about 1.5 per cent. of protein, but no carbohydrates or fat. Its nutritive value is not great.

4. **White of egg and dextrinized gruel,** made by beating up the white of one egg with eight ounces of dextrinized wheat flour gruel (1 ounce to quart) will sometimes agree. If it is acceptable, one to two even teaspoonfuls of granulated sugar may be added to the eight-ounce mixture,

which will then have about the following composition: protein 2 per cent. and carbohydrates 6 per cent.

5. **Yolk of egg and dextrinized gruel,** made by adding the yolk of one fresh egg to eight ounces of dextrinized wheat flour gruel (1 ounce to quart), and if tolerated adding one to two level teaspoonfuls of granulated sugar, is highly nutritious and especially rich in blood making substances. If well borne in malnutrition cases legume flour may be used in place of the wheat flour. This will increase the quantity of nucleoproteids in the food materially.

6. **Meat broths** oftentimes arouse the appetite, and if acceptable may be mixed with dextrinized gruels made with two to three ounces of flour to the quart, in equal parts, or they may be thickened with the gruel flours by stirring in an ounce of flour to the quart of broth and boiling. This will make a thick broth.

To make broths, take one pound of lean mutton, veal, or chicken with some cracked bone and cut into small squares; add one pint of cold water, heat gently, and allow to simmer for about three hours. Strain and add enough boiled water to make a pint of broth. When cool remove the fat or skim it off while hot. The broth will be gelatinous when cold and should be served warm.

7. **Beef tea** is often useful as a digestive stimulant and is made by taking a pound of lean beef and cutting it into small pieces and allowing it to stand in a pint of cold water for an hour. It is then heated to not above 160° F., and the meat is expressed through cheese cloth. If heated to above this temperature the albumin of the meat will coagulate. If the coagulum is allowed to remain in the tea none of the nutritive value will be lost, but if it is removed the tea will have little but flavor.

8. **Beef juice** is often a useful addition to other foods in cases of malnutrition, and may be made as follows:

a. Slightly broil a thick piece of round steak that is perfectly free from taint. Cut into small pieces and press in a clean meat press or lemon squeezer.

b. Cut the fresh steak into small pieces and just cover with cold, slightly salted water, and set on ice for several hours. Then press by squeezing in a piece of cheese-cloth.

The quantity of beef juice given should not be over one ounce in twenty-four hours, and it is given to best advantage when added a teaspoonful at a time to other feedings, as in larger quantities the infant soon tires of it.

9. **Eiweissmilch.** One quart of whole milk is heated to 190° F. for three minutes and then cooled to body temperature. Add 3 teaspoonfuls of

essence of pepsin to coagulate all of the casein. Break up the curd with a fork or spoon and allow to settle. The precipitated casein is allowed to settle and the liquid part is decanted. Straining the curd through linen or a wire strainer is impossible because the curd is of such consistency that the meshes of the strainer are quickly obliterated so that no drainage takes place. After all of the liquid has been removed and only the curd remains this precipitate may then be put into a wire strainer and the remaining portion of the whey allowed to drain off. This dry curd is then pushed through a fine wire strainer by means of a spoon, into one pint of buttermilk and one pint of water. After the curd is strained into an empty dish, the particles quickly adhere and you have gained practically nothing by straining. This precipitate must be strained into liquid in order to make use of the colloidal action so that these particles will remain separated. The buttermilk, water and curd is then strained again, put into glass jars or bottles and kept on the ice. (*Hunt.*)

10. **Buttermilk.** A *pure* culture of lactic acid bacilli is added to skimmed milk in an earthenware dish, and allowed to stand at about 70° F. for twenty-four hours, or until the casein is coagulated. Stir vigorously with a spoon or egg beater until the curd is very small, and then push the contents through a fine wire strainer with a spoon. If the buttermilk is too thick add a small amount of water. When the buttermilk is once made, a small portion (about four ounces) may be used as the inoculating agent for the next supply to be made. In this way the original culture may be made to last from six to eight weeks. The quality and action of product made will vary but little. Add the four ounces of buttermilk to the fresh milk, incubate and follow the above outline. Sometimes the milk will not coagulate although it may smell sour. Stirring gently with a spoon will often produce coagulation in a few minutes. The fat present will rise to the top and when coagulated appears as a brownish yellow scum which may be removed before the curd is broken up. (*Hunt.*)

If any of the mixtures just given agrees, attempts at adding fresh cow's milk, a teaspoonful at a time, may be made. If the milk is tolerated the quantity may be increased cautiously until it forms one-fourth of the mixture, when the fats may be increased and the infant can be put on a formula suitable for its age as indicated on page 134.

When all Attempts at Adding Fresh Milk Fail.

When infants fail to thrive on any of the foregoing mixtures and all attempts at giving fresh milk in any quantity fail, the following mixtures may be tried and often are highly successful. Whenever the foods that are cooked are used, a teaspoonful or two of beef juice or orange juice should be given daily, as on such foods infants are liable to develop scurvy.

Formula No. 1.

Whole milk	12 ounces.
Wheat or oat gruel flour	4 level tablespoonfuls.
Granulated sugar	2 level tablespoonfuls.
Salt	1 pinch.
Cold water	22 ounces.

Mix *cold* and with constant stirring slowly bring to a boil and boil for three minutes. Strain and add enough boiled water to make thirty-two ounces. Feed quantity appropriate for age. For young infants or very delicate ones the food may be diluted with one part of water to two parts of the food.

Approximate Composition.— Fat, 1.5 per cent.; carbohydrates (starch, milk-sugar, cane-sugar), 7 per cent.; protein, 1.5 per cent.

By using the top 16 ounces from one quart of milk and taking 12 ounces of this instead of whole milk in the above mixture the percentages will be: Fat, 2.5 per cent.; carbohydrates, 7 per cent.; and protein, 1.5 per cent.

Formula No. 2.

Whole milk	12 ounces.
Wheat or oat gruel flour	4 level tablespoonfuls.
Glycerite of diastase (Cereo)	3 teaspoonfuls.
Salt	1 pinch.
Cold water	22 ounces.

Mix *cold* and with constant stirring bring slowly to a boil, and boil for five minutes. Strain and add enough boiled water to make 32 ounces. Feed quantity appropriate for age, or dilute two parts of the food with one part of water for very young or delicate infants.

Approximate Composition.— Fat, 1.5 per cent.; carbohydrates (soluble starch, dextrin, maltose, milk-sugar), 6 per cent.; proteins, 1.8 per cent.

If top 16 ounce milk is used instead of whole milk, the percentage of fat will be 2.5 per cent.

With both of the formulas above it will be better to begin with whole milk and increase to top sixteen ounce milk if digestion is good.

Keller's malt soup is a mixture similar to the above. The carbohydrates in the mixture are starch, maltose, and milk-sugar. It is prepared as follows:

Wheat flour	2 ounces.
Whole Milk	11 ounces.

Mix and rub through a fine strainer thoroughly. In another vessel add to 20 ounces of water, and 3 ounces of malt extract (Keller uses Liebig's), warm to 120° F. and add 2½ drachms of a 11 per cent. solution of bicarbonate of potash. Now boil these together. The approximate composition will be: Fat, 1.2 per cent.; proteins, 2.0 per cent., and carbohydrates, 12.1 per cent.

A few cases may be met in which no food previously suggested agrees. In these cases condensed milk, peptonized milk, or buttermilk may solve the problem.

Condensed Milk Mixtures.— Fresh condensed milk is to be preferred, but if unobtainable the best brands of sweetened condensed milk should be employed. A teaspoonful of condensed milk to four ounces of plain or dextrinized gruel may be used at the start. If this is well borne, the quantity of condensed milk should be rapidly increased until two to four teaspoonfuls to four ounces of diluent are used. Then equal parts of top milk and condensed milk should be mixed and used for dilution, which may be reduced until one part of this mixture is used with five parts of diluent.

Peptonized Milk. *Warm Process.*— (1) Empty into a clean quart bottle the contents of one of Fairchild's peptonizing tubes; (2) add four ounces (eight tablespoonfuls) of cold water; shake, and (3) add one pint of cool fresh milk and again shake; (4) place the bottle in water not too hot to be uncomfortable to the hand for ten minutes. Then either place on ice or boil to prevent further digestive action. This milk is likely to taste bitter.

Cold Process.— Prepare the bottle as before, but set on ice without warming. This milk is only partially peptonized so will not have a bitter taste.

Buttermilk.— For temporary use buttermilk has a limited field. It is best made at home by using a pure lactic acid ferment. Natural buttermilk contains little fat, as this has been removed as butter. In making buttermilk the cream may be removed and the ferment added to the skimmed milk, or whole milk may be used (see 10, p. 146).

Two types of buttermilk food are employed. First, the raw buttermilk, which contains enormous numbers of lactic bacteria; second, buttermilk to which one ounce of flour (four level tablespoonfuls) is added to the quart, and boiled. Raw buttermilk introduces harmless bacteria into the digestive tract which may kill off those present that are harmful. Cooked buttermilk supplies a fairly sterile acidified food in which the casein is finely divided and cannot form a solid mass in the stomach.

Laboratory Feeding.— In many of the larger cities are to be found the Walker-Gordon laboratories at which food for infants is prepared upon prescription of the physician. They were established as the results of Rotch's teachings. Prescription blanks are furnished for those who wish to write out specific formulæ.

Calorie Feeding.— An attempt has been made to establish a calorimetric standard for use in feeding infants. A Calorie is a measure of heat, being the amount of heat required to raise the temperature of one liter of water one degree Centigrade. Heat, as is well known, is produced by chemical action, friction, mechanical movements, and in the utilization of food by the animal organism.

It has been determined by experiment just how much heat is produced by the oxidation of practically all fo[illegible]es and the burning of different kinds of fuel.

Fats, sugars, starches, meats, and other forms of protein will all produce heat, and all are digestible. If the heat or caloric value was all infants or adults needed food for, it would be immaterial what article of diet was employed. But foods that are of equal heat producing value, and which are also digestible, are not interchangeable for different individuals, and growth and tissue repair do not depend upon the storage of heat, but upon the assimilation of protein. In infant feeding, particularly, where growth or the storage of protein is the chief phenomenon of nutrition, the main point to be considered is not, will the food supply heat, but, is it capable of causing growth?

Table of Caloric Food Values.

1 oz. Protein	yields	123	calories.
1 oz. Carbohydrates	"	123	"
1 oz. Fat	"	288	"

Key to Caloric Values of Percentage Mixtures.

1 oz. Food containing 1% Protein	yields	1.23	calories.
1 oz. " " 1% Carbohydrates	"	1.23	"
1 oz. " " 1% Fat	"	2.88	"

Example of Use of Key.

What is the caloric value of 32 oz. of breast milk whose composition is protein 2 per cent., carbohydrates 7 per cent., fat 4 per cent.?

32 oz. × 2% Protein × 1.23 cal. = 78.72 cal. from Protein.
32 oz. × 7% Carbohydrates × 1.23 " = 275.52 " " Carbohydrates.
32 oz. × 4% Fat × 2.88 " = 358.4 " " Fat.

712.64 cal.

For roughly comparing the heat values of mixed diets, which prove to be suitable for the particular case from the digestive standpoint.

Approximate Composition and Caloric Value of Foods Used in Infant Feeding.

	Water, per cent.	Protein, per cent.	Fat, per cent.	Carbohydrates, per cent.	Calories to 1 oz.
Human milk	87.0	2.0	4.0	7.0	22
Cow's milk:					
Ordinary milk	89.0	3.0	3.0	5.0	18.5
Good milk	87.0	3.3	4.0	5.0	21.0
Jersey milk	86.5	3.5	5.5	5.0	26.0
Cream	74.0	2.5	18.5	4.5	62.0
Top milk 16% fat	77.0	2.5	16.0	4.5	55.0
Top milk 12% fat	80.0	3.0	12.0	5.0	44.0
Top milk 10% fat	83.5	3.2	10.0	5.0	39.0
Top milk 7% fat	84.8	3,2	7.0	5.0	30.0
Skim milk	90.5	3.4	0.3	5.1	11.0
Buttermilk	91.0	3.0	0.5	4.8	10.0
Koumyss	89.3	2.8	2.1	5.4	15.0
Condensed milk (sweetened)	26.9	8.8	8.3	54.1	95.0
Evaporated milk	68.2	9.6	9.3	11.2	48.0
Whey	93.0	1.0	0.3	5.0	8.0
Cereals for Gruels:					
Wheat flour	12.0	11.4	1.0	75.1	104
Entire wheat flour	11.4	13.8	1.9	71.9	105
Robinson's patent barley	9.4	7.4	....	81.5	109
Cereo Co.'s barley	7.0	14.0	....	77.0	110
Cereo Co.'s oat flour	7.3	16.0	7.2	67.8	120
Cereo Co.'s legume flour	6.5	25.0	....	67.0	113
Cereo Co.'s soy bean flour	5.0	44.0	19.0	10.9	120
Rice, flaked	9.5	7.9	0.4	81.9	105

When the composition and weights of the foods eaten are known, and also to act as a sort of check, the caloric values of the foods may serve a useful purpose, and to enable those who wish to become familiar with caloric food values the preceding key and table are given.

Heubner gives the following caloric requirements for infancy:

First three months, 100 calories per kilo of body weight; second three months, 90 calories per kilo of body weight; after that, until the end of the first year, 80 calories per kilo.

Langstein-Meyer gives the following caloric needs:

1– 2 weeks, 107 calories per kilo of body weight.
13–14 " 91 " " " " " "
25–36 " 83 " " " " " "
37–44 " 69 " " " " " "

The usual percentage system as applied in this country gives a very close approximation of the caloric needs as they have thus been worked out. A kilo represents 2.2 lbs.

Finkelstein's Classification.

The nutritional troubles of the breast and artificially fed infants this author divides into:

(1) Those due to *weight disturbances*, in which, in spite of seemingly adequate formulæ, the weight goes up and down, and who become worse if the fat content is increased. Their stools are soapy, dry and light-colored. The condition is relieved by cutting down the high fats to whole or skimmed milk and giving malt sugar preparations up to eight per cent.

(2) *Dyspepsia* follows aggravation of the symptoms enumerated under (1). The weight now remains stationary or declines; there is an irregular temperature, with stools showing intestinal fermentation and a tendency to diarrhea. Breast milk should be furnished or skimmed milk without any sugar, or with Keller's malt soup, is to be given.

(3) *Atrophy or decomposition* follows a fat and salt intolerance with rapid loss of weight. There is a starvation cry and beefy tongue. The temperature is apt to be subnormal and stools foul and undigested. Anasarca and cyanosis may precede death.

Here breast milk is imperative, and even this may have to be diluted or skimmed.

(4) *Intoxication* (compares with our exogenous infective diarrheas) and may complicate any of the above or arise *de novo*. There is a marked sugar intolerance, but protein digestion is unimpaired. The fever is intermittent with toxic symptoms. The stools are watery and frequent. The urine contains some albumin and casts and sometimes lactose or galactose;

weight is lost rapidly and somnolence or stupor supervene. The condition is combatted by withdrawal to a cooler atmosphere, stopping all sugar, and feeding with Eiweiss milk (see p. 145). Sugar only is added when the symptoms subside.

Directions for the Mother or Nurse.

Education of Mother Necessary.— One of the greatest aids in the feeding of infants artificially is intelligent cooperation of the mother, and it should be explained to her that as she would naturally feed the infant until its digestive organs are sufficiently developed to digest soft table food, it is her duty to become acquainted with the details of preparing and administering artificial food. Time expended in teaching a mother how to prepare food and why the different processes are used will be well spent, and will eventually repay the physician.

The mother or nurse should be shown just what she is expected to do. Directions should be written out. The feeding schedule on page 134 may be followed as a general guide as to what the formulas for different ages should be and the pictorial directions (page 135) when shown to a mother will make things clearer than long explanations.

Care of Food.— When a good, clean milk cannot be obtained, or when the conditions are such that the food, after being prepared, cannot be kept below 50° F., it should be pasteurized. The fact that the food is kept in a refrigerator does not necessarily mean that it is kept cool, as the temperature in some refrigerators is above 60° F. The food should be kept surrounded by ice.

Nursing bottles of the style shown in Fig. 45 should be used, as they can be readily cleaned. After the food is placed in them they should be stoppered with clean absorbent cotton. Corks should not be used, as the milk gets into the pores and sours, or otherwise spoils and infects the next feeding.

If the food is to be pasteurized the Freeman pasteurizer (Fig. 46) may be used, or when this is not available a home-made pasteurizer may be employed (Figs. 47, 48). This is made from a six-quart tin pail. A false bottom is made by punching holes in a tin pie plate which is then inverted in the pail. The bottles of food or milk are placed on the false bottom, and water is poured around them up to the level of the milk. The pail is then placed on a stove and the water brought to a temperature of 165° F., as determined by a thermometer. The pail is now covered with a cloth and removed from the stove, and allowed to stand for half an hour. A folded newspaper is a good thing to stand the pail on, as it will prevent too rapid loss of heat. After standing half an hour the food or milk should be cooled by placing it in cold water, until thoroughly cooled, otherwise the bacterial spores which are not destroyed by pasteurizing will germinate and

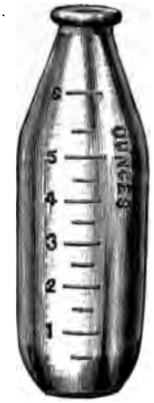


FIG. 45.— Nursing bottle, preferable type.

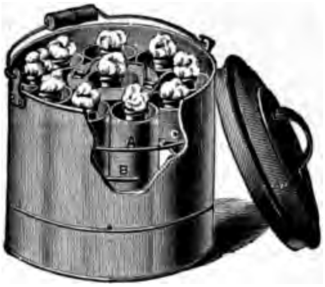


FIG. 46.— Freeman pasteurizer.

may cause disturbance of the infant's digestive tract. Old pasteurized milk should never be used. Fresh food should be made every day.

Administration of Food.— Regularity in feeding should be insisted upon. The food should be slightly warmed by placing the bottle in warm

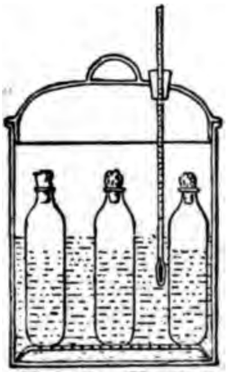


FIG. 47.— Home-made pasteurizer. (*Russell.*)

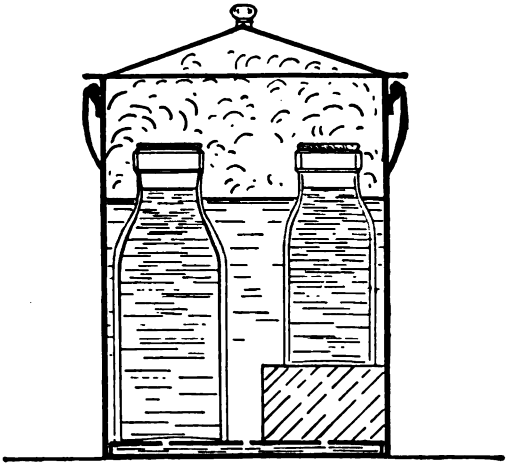


FIG. 48.— Pasteurizer for bottled milk. (*Russell.*)

water for a few minutes. Night feedings should not be warmed before retiring and kept warm. This is a perni[illegible]ce. The cotton stopper is then removed and a black rubbe[illegible]e placed on the bottle, which should be inverted to see that the hole in the nipple is large enough to allow the food to drop slowly, but not so large as to permit the food to run in a stream. The mother or nurse should be cautioned not to put the nipple in her mouth. By allowing the food to drop on the wrist it will be possible to determine whether it is too hot or too cold.

The infant should not be over twenty minutes in taking its food, and if satisfied will drop off to sleep. Never use the food that may be left in the bottle, but throw it away. If a considerable portion of the food is left in the bottle the nipple should be examined to see if the hole is too small or has become clogged.

Care of Utensils.— After preparing food the dipper, double boiler, bottles, spoons, and all articles that have been used should be washed, first with cold water, and then with soap or washing compound and hot water, and then scalded. The bottles should be cleaned with a brush (Fig. 49), and after being scalded should be kept inverted until ready to be filled again. The nipples should be thoroughly washed and kept lying in a cup of water in which a good-sized pinch of borax has been dissolved.

Examination of Stools.—The mother should be taught to examine the stools and to report to the physisian the appearance of anything abnormal, as change of color, diarrhea, the appearance of curds or of mucus. The mother should not be taught that these are alarming symptoms, but that they indicate something is wrong and needs attention.

FIG. 49.—Bottle brush.

How to Interpret Results.

Weighing the Infant Important.— Infants should be weighed at regular intervals in about the same clothing, as steady gain in weight is one of the indications that they are thriving on their food. But judging the value of a food by the mere fact that it causes gain in weight is quite wrong, as the gain may be only in fat.

The composition of the food, the general development and gain in weight should be taken into consideration, and no infant should be dismissed until its food contains considerably over one per cent. of protein and it is gaining in weight on it.

The gain in weight is greatest in proportion during the first few months, as food is assimilated more completely at this period, as has been explained on page 125. Just how much an infant should gain each week cannot be stated definitely, as infants vary in this respect. Some will gain a pound and others not over two ounces, but the latter gain is too small for a healthy infant. Six ounces is a good gain. If the food is agreeing the quantity or strength may be increased cautiously to see if greater gain will result, but this plan must not be pushed to an extreme, for loss instead of gain may result. A record of the weight should be kept. Weight charts have been prepared on which is shown the "normal weight curve" deduced from the average gains of a large number of infants. It is better not to use this style of weight chart, as few infants pass their first year without some ups and downs, and the slightest variation from the "normal curve" is a cause of worry and anxiety to the mother and through her to the physician.

Feeding in Hot Weather.— Upon the advent of hot weather special precautions should be taken to forestall attacks of gastroenteritis. The means for keeping the food cool should be looked after, and tested with a self-registering thermometer, or the food should be kept packed in ice to make sure it is kept cool. Pasteurization is a safeguard, particularly if ice is not available. If the infant has a tendency to indigestion or to vomiting, the amount of fat in the food should be reduced. One or two feedings of gruel used as the diluent may be put up, and given as night feedings or as substitutes when milk feedings seem to disagree.

If the air is humid and the temperature high, the infant should be given a sponge bath twice a day. The excess of body heat is excreted by the evaporation of perspiration, and this is retarded by high humidity. And unless the skin is kept clean and free from the residue from the evaporation of perspiration, this will also retard evaporation.

Feeding when Traveling.— Changes in the food are risky at any time, and especially so when traveling. A good plan to follow is to have the regular food prepared and packed in ice to insure thorough cooling and then to place it in vacuum bottles. The bottles should be filled right up to the stopper, otherwise the agitation of the food will churn the milk so that the fat will separate as butter. Several of these bottles will be required if the journey is to last several days. If there is a question about the food being kept cool, it should be pasteurized, then cooled or iced if possible, before being put into the vacuum bottle. These bottles will keep food cold for about seventy-two hours.

The food for the infant can be poured from the vacuum bottle into a clean nursing bottle and warmed as wanted. But the food should be slightly shaken so as to mix the cream which will have risen to the top with the remaining milk. The food should not be warmed and then kept in one of these bottles to save warming. Milk [illegible] kept warm.

For a single day's journey the food may be put up as usual in the home and boiled and put in a pail with cracked ice around the bottles.

When it is not possible to have the foregoing directions carried out, one of the best brands of sweetened condensed milk diluted with boiled water may be used. The boiled water may be carried if it will not be obtainable during the journey.

Feeding when Away from Home.— During the heated term large numbers of families leave the cities and live in the country at boarding houses, hotels, or in their own homes. In many of the more remote districts the milk-supply problem has not yet been solved, and much disturbance may be caused by milk which has been improperly handled through ignorance.

In such instances the mother should make an arrangement with some milkman or farmer to supply milk produced under sanitary conditions. The farmer should be instructed to clean the cows as thoroughly as he cleans his horses, to wipe the belly and udder with a damp cloth before milking, to wash his hands before milking, and to reject the first two or three jets from each teat. The milk pail should be well washed and scalded after being used, and kept inverted in the sun. As soon as the milking is finished the milk should be mixed, as it is not uniform in composition as it leaves the cow, and then poured into quart milk bottles. These should be set in ice-water, or if this is not obtainable, into cold well water which rises nearly to the tops of the bottles. The milk can be delivered in the morning in time to prepare the food for the day.

Such milk will cost more than the ordinary milk, but it is worth all it costs, and will be found cheaper in the end. The mother should see for herself that the milk is produced under cleanly conditions. She would not tolerate a filthy wet-nurse for her infant and should not allow her infant's food to come from a filthy cow.

Feeding Among the Poor.— The preparation of food or even obtaining suitable food materials is often a perplexing problem among the poor and in the tenements of large cities. The intelligence of the mother may be limited, and even when the mother is capable of carrying out directions the facilities for preparing food and keeping it cool are wanting. Some families are too poor to buy clean bottled milk at ten cents a quart, and oftentimes such milk is not offered for sale in the poorer sections of a community.

Correct dietetic principles must be applied as best they can be. Where good milk can be obtained, but careful modification cannot be expected, the food may be made with whole milk and gruel, using one-fourth, one-third, and one-half milk and adding one part of granulated sugar to thirty-three parts of food, or two level tablespoonfuls to the quart of food.

Where good milk is unobtainable, condensed milk may be used with water or barley gruel made with one ounce of flour to the quart. The milk should be diluted 8 to 15 times, that is, one part of condensed milk to 7 to 14 parts of water or gruel. No sugar is to be added. Cod-liver oil or olive oil can be given daily, one teaspoonful three times a day, to supply the fats.

Infant's Food Dispensaries.— The unsatisfactory results obtained in infant-feeding among the tenement population, owing to improper preparation of food or lack of suitable food, has led to the establishment of food dispensaries in the crowded sections of many cities. There are three types of these feeding stations: (1) Those at which a few formulas of modified milk may be obtained in nursing bottles by anyone who applies for them. (2) Those at which modifications of milk are given by trained physicians who examine the applicants and aim to give a formula which is likely to agree. (3) Those at which the food is prepared for each infant while it waits, upon the prescription of the attending physician.

The feeding stations at which food is dealt out without taking into consideration the condition of the infant are not to be encouraged, for while they do much good, they also do harm.

During the heated term feedings of plain and dextrinized gruels made with one to two ounces of barley flour to the quart should be kept on hand to be given when milk feedings disagree: for infants that are quite sick they may be diluted once with boiled water.

CHAPTER XVI.

DIET DURING THE SECOND YEAR.

By the beginning of the second year the infant's digestive organs should be sufficiently developed to warrant giving some soft food. The greatest amount of trouble will be caused by cereals which are not properly cooked. Fig. 50 shows a cross-section of an oat grain. It will be observed that the protein and carbohydrates are inclosed in cells. These are composed of cellulose which is indigestible, and they must be ruptured by cooking before the digestive secretions can get at their contents. Fig. 51 shows what takes place when cereals and vegetables are cooked properly and too much emphasis cannot be laid upon the importance of thoroughly cooking cereals. Oatmeal particularly should be cooked in a double boiler several hours. Flours do not need such long cooking.

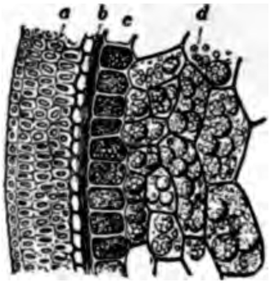


FIG. 50.— Section of oat grain. c. protein layer; d, starch and protein. (*Goodale.*)

The following schedule has been arranged as a suggestive scheme for the feeding of older normal children:

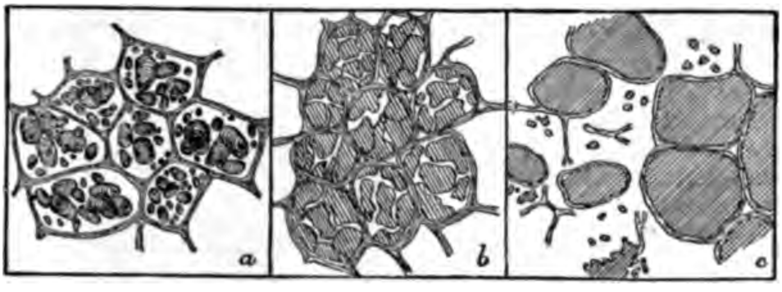


FIG. 51.— Rupture of starch grains by cooking. (*Langworthy.*)

Many children are indiscriminately fed, and the physician being unfamiliar with the kind of food suitable and agreeable to the child neglects to supply directions as to the dietary. Changes should be made in the list if there is illness, habitual constipation, or difficulty in digesting certain forms of food. It should be recollected that the child can be ***trained to like*** almost every suitable article, and it is a mistake to cater to their likes and dislikes if they are not developing and gaining weight.

Under their respective sections changes in the character of the food have been suggested where they have any bearing on the progress of the disease.

Dietary.

Twelfth to Eighteenth Month.— Select from the following articles:

First meal — on arising.

Juice of a sweet orange, one to two ounces.
Pulp of six stewed prunes.
Pineapple juice, one ounce.
Milk, eight ounces, zwieback, toasted biscuits (as Huntley & Palmer's), stale toasted bread.

Second meal — during forenoon.

Milk alone or with zwieback.

Noon meal.

Soup made of chicken, beef, or mutton, six ounces; or beef juice three ounces. Stale or toasted bread may be added to the above.

Fourth meal — afternoon.

Milk, or toasted bread and milk.

Evening meal.

Gruel made of oatmeal, farina or barley, taken with whole milk, four ounces of each.
Apple sauce or prune jelly.
Zwieback.

Eighteenth to the Twenty-fourth Month.

Breakfast.

Juice of one sweet orange.
Pulp of six stewed prunes.
Pineapple juice, one ounce.
A cereal, such as cream of wheat, oatmeal, farina, or hominy preparations with top milk (top 16 oz.). Sweetened or salted.
A glass of milk.

CHAPTER XVI.

DIET DURING THE SECOND YEAR.

By the beginning of the second year the infant's digestive organs should be sufficiently developed to warrant giving some soft food. The greatest amount of trouble will be caused by cereals which are not properly cooked. Fig. 50 shows a cross-section of an oat grain. It will be observed that the protein and carbohydrates are inclosed in cells. These are composed of cellulose which is indigestible, and they must be ruptured by cooking before the digestive secretions can get at their contents. Fig. 51 shows what takes place when cereals and vegetables are cooked properly and too much emphasis cannot be laid upon the importance of thoroughly cooking cereals. Oatmeal particularly should be cooked in a double boiler several hours. Flours do not need such long cooking.

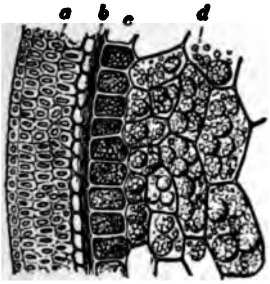


FIG. 50.— Section of oat grain, *c*, protein layer; *d*, starch and protein. (*Goodale.*)

The following schedule has been arranged as a suggestive scheme for the feeding of older normal children:

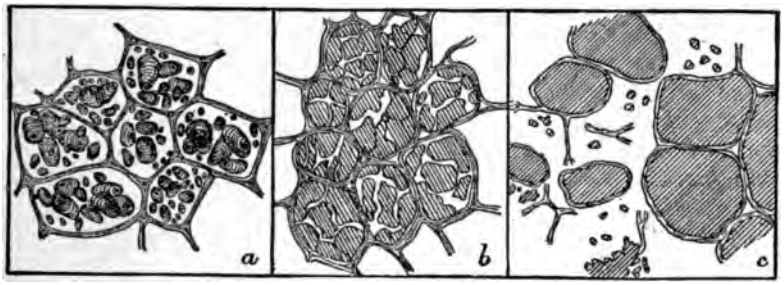


FIG. 51.— Rupture of starch grains by cooking. (*Langworthy.*)

Many children are indiscriminately fed, and the physician being unfamiliar with the kind of food suitable and agreeable to the child neglects to supply directions as to the dietary. Changes should be made in the list

Supper.

Stewed fruit.

A cereal or egg (if not taken for breakfast); bread and milk; or custard; cup of warm milk or cocoa; crackers or zwieback.

Three to Six Years.

Breakfast.

Fruits.— Oranges, cantaloupe, apples, or stewed prunes.

Cereal.— Oatmeal, hominy, rice and wheat preparations, well cooked and salted, as described on page 157, with thin cream and sugar.

Eggs.— Soft boiled, poached.

Milk.— Milk or cocoa to drink.

Dinner.

Soups.— Beef, chicken, or mutton, or milk soups.

Meat.— Chicken, beefsteak or roast beef, lamb chops, fish.

Vegetables.— Spinach, carrots, string beans, peas, cauliflower tops, mashed or baked potato, asparagus tips.

Bread and butter (not fresh bread or rolls).

Dessert.— Custard, rice or bread pudding, tapioca, ice cream (once a week), prune souffle, or baked apple.

Milk.

Supper.

Milk toast, or a thick soup, as pea, or cream of celery, or a cereal and thin cream. Egg. Stewed fruit, custard or a plain pudding, graham crackers and milk.

Suggestive Diet List Suitable for Children's Hospitals.

Monday.

Breakfast.— Oatmeal, bread and butter, milk.
Dinner.— Beef soup, chicken, mashed potatoes, bread and butter, corn starch pudding, milk.
Supper.— Bread and butter, milk, apple sauce.

Tuesday.

Breakfast.— Eggs, bread and butter, milk.
Dinner.— Chicken soup, chicken, mashed potatoes, bread and butter, rice pudd [illegible] milk.
Supper.— Bread and butter, milk, stewed prunes.

Wednesday.

Breakfast.— Hominy, bread and butter, milk.
Dinner.— Beef soup, roast beef, mashed
milk.
Supper.— Bread and butter, jam,

Thursday.

Breakfast.— Eggs, bread and butter, milk.
Dinner.— Beef soup, chicken, mashed potatoes, bread and butter, ice cream, milk.
Supper.— Bread and butter, jam, and milk.

Friday.

Breakfast.— Oatmeal, bread and butter, milk.
Dinner.— Mutton broth, roast mutton, mashed potatoes, bread and butter, custard pudding, milk.
Supper.— Bread and butter, milk, apple sauce.

Saturday.

Breakfast.— Hominy, bread and butter, milk.
Dinner.— Beef soup, roast beef, mashed potatoes, bread and butter, chocolate pudding, milk.
Supper.— Bread and butter, milk, stewed prunes.

Sunday.

Breakfast.— Oatmeal, bread and butter, milk.
Dinner.— Beef soup, roast beef, mashed potatoes, bread and butter, ice cream, milk.
Supper.— Bread and butter, milk, jelly.

Suggestive Diet Lists for Day Nurseries and Crèches.

Group 1 (Bottle-weaned babies).

Milk (whole milk), warm or cold, 8 ounces.
Farina gruel with milk and sugar, zwieback.
Beef or mutton soup, thickened with toast crumbs.
Orange juice, 1 ounce.
Apple sauce.
Prune pulp.
Amount needed daily — three meals — 24 ounces milk, 10 ounces soup, zwieback, 2 pieces, fruit, one kind.

Group 2 ("Runabouts").

Milk.
Zwieback or toast, or stale bread.
Soft-boiled egg.
Farina, cream of wheat, oatmeal.
Soup, beef or mutton thickened with split peas, rice, or farina.
Baked potato, mashed potato, carrots, beets.
Custard, cornstarch, farina pudding, apple sauce, prune jelly, or apple butter.
Amount required daily, three meals, 36 ounces of milk, one cereal, one vegetable, one soup, bread, one fruit.

Group 3 (Kindergartners -- two meals).

Bowl of crackers and milk, farina, oatmeal.
Beef or mutton stew.
[illegible], soft-boiled or scrambled.
[illegible] potato, peas, carrots, beets, cauliflower.
nstarch pudding, baked apple, apple sauce, prunes.
ree cups milk, soup, vegetable, bread and butter,

GROUP 4 (School age).

Noon.
- Soup, beef or mutton.
- Beef or mutton stew.
- Potato (mashed), spinach, carrots, or beets.
- Bread and butter.
- Pudding, farina, rice, cornstarch.

4 P. M.
- Milk, cocoa.
- Bread and butter, jam.
- Raw apples.

Diet During Later Childhood

The period of growth from early childhood to puberty requires careful oversight of the nutrition. The child must be regularly trained in all the hygienic details of feeding, including slow eating and the avoidance of strenuous exercise just before or after eating. The diet requires a large amount of protein owing to the rapid growth, and this must be supplied principally by the ordinary meats (beef, mutton, and chicken) and such vegetables as peas and beans. All the cereals will also supply some protein with a large amount of starch. The heat- and energy-producing foods (starches, sugars, and fats) may be supplied in the form of potatoes, cereals, fruits, and fats from milk or meat. It is very desirable to train the child to take a varied and properly balanced diet, which includes all the foods in common use. Thus if very much meat is taken to the exclusion of carbohydrates, the protein will be employed too largely in oxidation to produce body heat instead of in building tissue, and hence growth may be retarded. A certain amount of the carbohydrates acts as protein sparers, and thus allows the protein to be used entirely in its proper function of building tissue. This is an example of the desirability of a properly balanced diet. The green and succulent vegetables and fruits also have an important function in nutrition, as is seen in cases of scorbutus where there has been a long deprivation of these articles of diet. Lesser degrees of malnutrition result if they are not taken in proper amount.

The two usual cycles of growth, namely, at the second dentition and adolescence, require an especially generous diet. Rapid growth always uses up nutrient material and hence calls for food rich in protein, otherwise various grades of anemia are liable to result.

Dietary Suitable for Children After the Sixth Year.

Soups.— Beef broth, chicken broth, mutton broth, oyster broth, bouillon, milk soups, purees of vegetables, legumenose soups.

Vegetables.— Peas, carrots, spinach, baked potato, mashed potato, stewed potato, celery, string beans, lima beans, beets, beet-tops, rhubarb, squash, pumpkin, lettuce, endive, stewed tomatoes.

Eggs.— Soft-boiled, poached eggs, scrambled eggs, omelet (plain).

Sea Food.— Raw oysters, steamed oysters, boiled fish, broiled fish.

Meats.— Beefsteak, roast beef, roast chicken, minced chicken, boiled chicken, broiled chicken, roast mutton, roast lamb, lamb chop, turkey, squab, sweetbreads.

Farinaceous.— White bread, whole wheat bread, graham bread, corn cake (not hot), gems, toast, plain crackers, educators, zwieback, farina, cream of wheat, oatmeal, rice, hominy, macaroni (plain), spaghetti (plain).

Fats.— Cream, butter, olive oil, peanut butter.

Beverages.— Milk, topmilk, buttermilk, cocoa, matzoon.

Dessert.— Stewed fruits, baked custard, bread pudding, cornstarch pudding, rice pudding, tapioca pudding, junket, plain cake, ice cream.

Fruits.— Raw apples, baked apples, apple sauce, stewed prunes, stewed figs, pears, peaches, grapes, oranges, grape-fruit, melons, strawberries, raspberries, blue berries, blackberries.

Suggestive Diets for Special Conditions.

DIET AFTER AN ATTACK OF RECURRENT VOMITING (FOR 4 YEARS OR OVER).

***May** have for the first two weeks the following:*

Oatmeal, Pettijohn, farina, cream of wheat, rice, yellow corn meal, milk toast, graham bread (stale).

Baked apple, apple sauce, stewed prunes, stewed figs.

Purees of vegetables, as celery, spinach, carrots, peas, baked or mashed potato.

White meat of chicken, sweetbreads.

Junket, baked custard, cornstarch pudding, bread pudding, blanc mange, home-made ice cream (once a week), milk after removal of top 2 oz., cocoa, buttermilk.

***May** have after two weeks the following in addition:*

Steamed oysters, broiled fish, butter, spinach, peas, lettuce, rice pudding, mutton broth, chicken broth.

Eggs.— Soft-boiled, coddled, dropped.

Lamb chop, beefsteak, roast beef, chicken (roasted, minced, boiled or broiled).

Beets, carrots.

Stewed apples or stewed pears.

DIET TO OVERCOME CONSTIPATION: SUITABLE FOR A CHILD 8 YEARS OLD.

Breakfast.

Juice of a sweet orange, or six stewed prunes, or baked apple, or stewed peaches.

A cereal, as oatmeal, farina, rice, hominy or corn meal, with top milk or butter, as preferred, or a soft-boiled egg, or egg poached or coddled, with bran biscuits or muffins, or graham bread.

A glass of milk.

Dinner.

Broth or soup made of chicken, beef or mutton, thickened with split peas, or rice with yolk of egg or toast squares.

Puree of peas, carrots, or potato.

Broiled lamb chops, beefsteak, chicken, roast lamb, saddle of mutton, roast beef, roast chicken, minced chicken, boiled chicken, broiled fish as halibut or sole.

Carrots, beets, squash, cauliflower tops, mashed or baked potato, celery, peas, beet greens, spinach, string beans, young lima beans, plain macaroni, spaghetti, graham bread and butter, a glass of milk, graham crackers, bran biscuits.

Dessert.— Apple sauce, baked apple, plain rice pudding, bread pudding, tapioca pudding, junket, baked custard, ice cream (home made) twice a week.

Supper.

Stewed fruit and a cereal or egg (if egg is not taken at breakfast), custard or rice, warm milk or cocoa with graham crackers or graham bread, or bran biscuits.

RECIPE FOR BRAN MUFFINS.

1 egg.
1 pinch of salt.
½ cup of molasses.
1½ cups of milk.
2 cups of bran.
1 cup of flour.
1 teaspoonful of soda.

Beat egg and salt together, add molasses and milk; mix in bran and flour last. Moisten the soda with a tablespoonful of warm water. Mix all together. Bake in moderate oven. (Do not get too stiff.)

DIET AFTER DIARRHEA ATTACK IN OLDER CHILDREN.

Skimmed milk boiled, baked potato, white meat of chicken, macaroni, farina, hominy, rice, toast, arrowroot crackers, soft eggs, cold boiled water.

When stools become formed allow:

Lamb chop, rare roast beef, strained apple sauce, carrots creamed, milk (remove top 2 ozs. of the cream and pasteurize).

Then gradually resume regular diet.

DIET LIST FOR OBESITY.

(Prepared for 10-year-old child.)

Breakfast.

1 orange, 3 pieces of toast or 4 pieces of bran bread, 1 butter ball, fish (except salmon or eels), 1 glass of milk (hot or cold).

Dinner.

One of the following soups: Bouillon, consommé, julienne, or any thin soup.

4 tablespoons of white meat of chicken, or 2 ounces of rare roast beef, or 2 ounces of rare mutton (very lean).

Liberal helping of string beans, spinach, celery, kale, cauliflower, cabbage, beans, asparagus, young onions, tomatoes, plain lettuce or with lemon juice, sour grapes (tart), orange.

Supper.

1 or 2 soft-boiled or poached eggs, 3 slices of bran bread, or 6 graham crackers.

Drink very little water, cup of cambric tea, cut up oranges.

Water taken preferably between meals if necessary.

If very hungry upon retiring, may have a glass of skim milk and 5 graham crackers.

To be judiciously increased as excessive weight is lost.

DIET PREPONDERATING IN CARBOHYDRATES.

(Prepared for 5-year-old child.)

Breakfast.

Juice of a sweet orange, or six stewed prunes, or baked apple, or 4 ozs. of apple sauce; 4 ozs. of a cereal, as oatmeal, farina, rice, sago, hominy, corn meal with butter; stale bread and butter, wheat bread, graham bread, 2 pieces.

Dinner.

3 tablespoons of carrots, 1 medium size mashed or baked potato, 3 tablespoons of beans, peas, sweet potato, beet greens, cauliflower,

celery, squash, beets, graham bread or graham cracker, 2 pieces; macaroni or spaghetti, 3 tablespoonfuls; stale bread and butter, 2 slices.

Desserts.— Apple sauce, 4 ozs.; baked apple; plain rice pudding, 4 ozs.; tapioca pudding, 4 ozs.; cornstarch pudding, 4 oz., or arrowroot pudding, 4 ozs.

Supper.

Stewed fruit, 4 ozs.; a cereal, 4 ozs., or peas or green vegetables, 3 tablespoons (whole wheat bread or graham bread if constipated).

After the two weeks may be added the following:

Whole orange, 1 egg, soft, coddled or shirred.
Racahout.— 1 tablespoon to 6 ozs. of water, once daily.
Milk, 1 pint for entire day.
Peanut butter, 2 teaspoons every other day.

An elastic dietary slip such as the following, prepared by Dr. C. H. Smith, can be readily adjusted by the practitioner to suit the needs of the individual child:

DIET LIST.

Date................ Diet for................

Breakfast. At..........

Fruit: Orange juice, or cooked apples, or stewed prunes, or stewed dry peaches.

Cereal (.... tablespoonfuls; *no sugar*): Oatmeal, wheatena, malt breakfast food, Pettijohn's, corn meal, cream of wheat, farina, hominy, rice. Cook two or three hours, night before, in double boiler.

Milk: .... cups (put part on cereal), or weak cocoa.

Toast, or zwieback, or bread, and butter.

Egg, soft boiled, poached, or scrambled (without butter).

Dinner. At..........

Soup: Broth or any cream soup may be given, if not greasy, but there is not much food in soup. Do not make this the main part of the meal.

Meat: One of these:

Beef steak (broiled), chopped beef (cooked dry in pan with no grease nor butter).

Roast beef.

Roast lamb, lamb chop (broiled or cooked in pan with no grease nor butter).

Chicken, roast or broiled (no gravy).

Fish, boiled cod or halibut.

Vegetables: Give .... tablespoonfuls of each, green and white, every day.

Green: Spinach, peas, stewed celery or knob celery, oyster plant, carrots, string beans, lima beans, squash, beets, greens, turnips, asparagus tips, stewed tomatoes, cauliflower, parsnips.

White: Potatoes (boiled, baked, mashed, creamed), sweet potatoes (boiled or baked), rice, macaroni, hominy.

Toast or stale bread.

Dessert: .... tablespoonfuls of rice or bread pudding (no raisins), junket, custard, cornstarch, gelatine, ice cream or cooked fruit.

Supper. At..........

Cereal, ... tablespoonfuls; milk, ... cups; toast or stale bread.

Or, bread, ... slices, and milk, ... cups, or milk toast.

Or, soup, ..., and bread, ... slices, and milk, ... cups.

Or, egg, ..., and toast and milk.

And cooked fruit: Apple sauce, baked apple, stewed prunes or stewed dried peaches may be given with any of the above. Give .... tablespoonfuls.

You May Also Give:

At ......: Orange juice or grape fruit juice. Raw apple, scraped.
At ......: Broth and crackers.
At ......: Graham crackers or
At ......: Milk, ... cup.

Water.

One glass may be taken with each meal; never any more at meals. Water should be given between meals, but not at bedtime. Boil the water and put on ice to cool.

Do Not Give:

Tea, coffee, soda water, beer, wine, whiskey, cider.

Fried food of any kind (meat, potato, eggs or fish).

Pork, veal, kidneys, greasy stews.

Gravy made from grease or drippings. Dish gravy (meat juice) is all right.

Candy. It is easier to give none at all. "A little" always means too much.
Sugar, jelly, sweet preserves.
Fresh bread, cake, pie, fried cakes, rich puddings.
Nuts, raisins.
Bananas, berries, cherries. Give no raw fruit of any kind in very hot weather. Raw apples must always be scraped with spoon or knife.
Corn, cabbage, cucumbers, egg plant.
Too much milk. One quart a day at most is enough for any child.

Rules for Eating:

Make every child

1. Wash hands and face before meals.
2. Eat slowly and chew food well.
3. Eat neatly. No child is too young to learn good manners.
4. Eat what is put before it. Let it go hungry if it will not eat proper food. Give no food that is not on the list.
5. Drink little water with meals. Do not let it wash food down with water or milk.
6. Rest after meals half an hour.
7. Eat only at meal times. Give no food between meals unless ordered by doctor.

Serve food warm and well cooked on clean dishes and clean table.
Keep flies away from food. One fly can give typhoid or summer complaint.
Good food is as cheap as poor food.
Do not spoil good food by frying.
Do not give a child tea, coffee, or beer, and think they are food. They are not nourishing at all, and do much harm.

Milk is the best food, but spoils easiest. Buy only bottled milk, and keep on the ice always.

SECTION V.

DISEASES OF THE DIGESTIVE SYSTEM.

CHAPTER XVII.

DISEASES OF THE MOUTH.

General Considerations.

It is very essential that the normal condition of the mouth be preserved in infancy, as the act of sucking may be impaired and thus result in malnutrition of the infant. The mucous membrane of the mouth is particularly delicate, and bacterial invasion follows readily any injury to its surface. Even well-meant but too vigorous cleansing by the attendant may lead to serious mouth disease. Not until the teeth are present should any special effort be made to cleanse the oral cavity. The primary teeth should receive regular attention, and the aim should be to preserve them as long as possible, and thus ensure a vigorous and well-formed permanent set. A soft tooth-brush, used with an up-and-down movement, will effectively cleanse the teeth from adhering particles of food, especially if the child learns to flush or gargle the mouth after its use.

The nodules formed near the raphe in infants are normal cystic bodies called epithelial pearls, and must not be considered pathological. We have seen harm done by measures used for their removal.

Desquamative Glossitis.

(*Geographic Tongue. Ringworm of the Tongue.*)

The above headings apply to a condition of the tongue in which there are areas sharply circumscribed by sinuous borders. The borders are made up of enlarged papillæ of a dull grayish color which tend to intensify the denuded areas. Numerous microorganisms of a low order are found especially in the borders of the patches. The variations in the outlines have given rise to the term "geographical tongue." It is found among all classes of children: it can only occasionally be associated with the derangement of the digestive tract. It gives no symptoms, and is productive only of alarm to the mother. It is most commonly seen in children under three years of age.

Treatment.— The mother should be reassured as to its unimportance. Nitrate of silver, ½ dram to the ounce, applied with a cotton swab and neutralized with a salt solution has seemingly arrested the process in a few cases. In others it has persisted for months, only to finally disappear spontaneously.

Simple Stomatitis.

(*Catarrhal Stomatitis.*)

Simple stomatitis is an inflammation of the mucous membrane of the mouth, with the chracteristic symptoms of pain, redness, and swelling, and an increase in the normal amount of secretion.

Etiology.— It is mainly observed in the first year of life, and results from some form of irritant, which may be chemical, mechanical, or thermal in its nature. Among those commonly causative are improperly prepared food, thumb or nipple sucking, and too vigorous mouth washing. Excessive use of carbohydrates, especially cane-sugar, may be a cause, and the disease is occasionally an accompaniment of prolonged fever due to intercurrent maladies.

Symptomatology.— The babe refuses to take its nourishment or has pain while taking it. This should direct attention to the mouth. .There is marked drooling, and on inspection, redness, swelling and congestion of the mucous membrane are apparent. The tongue may be more or less coated. The temperature, if elevated at all, is not high. There is no adenitis. The restlessness and irritability point to a constitutional involvement.

Treatment.— The affection tends to a spontaneous recovery, especially if the causative factor is removed. After a few days there is restitution to normal conditions. Prophylactic treatment embraces the constant care and cleanliness of everything coming into contact with the child's mouth. On the other hand, we have observed the inflammation following well-meant but too vigorous mouth cleansing. Local applications hasten recovery. A 1 per cent. solution of nitrate of silver may be brushed over the surface by the physician once a day, and a 2 per cent. solution of boric acid is swabbed on every two hours by the attendant.

The following is an excellent and soothing lotion for all forms of sore mouth:

℞ Sodii sulphit ....ʒj
Glycerini ....ʒss
Aquæ rosæ ....q.s. ad. ℥ij
M. Sig.—Paint over the tongue and inside of the cheeks every two or three hours with a camel's-hair brush.

Order the food diluted one-half and given cold. If the nipple is refused in an artificially fed baby, feed with the spoon or dropper. It is rarely necessary to resort to gavage.

Aphthous Stomatitis.

(*Herpetic Stomatitis, Aphthæ, Follicular Stomatitis, Vesicular Stomatitis, Maculofibrinous Stomatitis.*)

Definition.— A disease characterized by isolated yellowish-white spots on the lips, mouth, or palate, surrounded by a reddened mucous membrane.

Etiology.— No specific exciting cause has as yet been firmly established. The weight of evidence seems to point to an infective rather than to a neurotic origin, since clinically we have found its spread possible through communication. Lack of proper cleanliness is the cause in the great majority of cases. Most of the attacks occur during the second year of life; and we have in addition to uncleanliness of the mouth and utensils, the direct dirt infection produced by the crawling, hand-sucking infant. It is also seen occasionally in connection with such diseases as pneumonia, gastroenteritis, or the infectious diseases proper.

Lesion.— The superficial mucous membrance shows a fibroplastic exudate in a localized area, having a reddened areola. The process does not go on to ulceration, the mucous membrance healing without scar formation.

Symptomatology.— Before the lesions are observed it may be noted that food is refused or taken with discomfort by the infant. The pain causes irritability and disturbed sleep. There is sometimes a low febrile reaction. The breath is not foul. The saliva flows freely. After a few days the glands beneath the jaw may be somewhat enlarged and painful to the touch. Inspection shows a number of whitish spots, which sometimes coalesce, on the lips, cheeks, or palate, surrounded by a red ring. The pseudomembrane cannot be removed without exciting some slight bleeding.

Course and Prognosis.— The affection lasts about a week and tends to recovery. With proper treatment the course is considerably shortened.

Treatment.— Prophylactic. This embraces all that was said under simple stomatitis, and may be stated in one word — cleanliness.

Local.— The early application of a 2 per cent. solution of silver nitrate, once or twice daily, shortens the disease and makes the infant much more comfortable. A 2 per cent. solution of chlorate of potash may be applied by the attendant three times a day with a brush.

General.— A dose of castor oil is usually indicated and helpful. The diet should comprise cool milk or gruels until the disconfort has disappeared

Bednar's Aphthæ.

These are superficial ulcerations which occur in the new-born or in early infancy on either side of the palatine ridge at the hamular process. They are usually the result of traumatism caused by too energetic cleansing or the sucking of artificial nipples. This portion of the mucous membrane is normally thin and tightly-stretched, and therefore easily abraded. Not infrequently these ulcerations are seen following thrush. They are usually bilateral, about the size of a small bean, and are covered with a grayish-white necrotic coating which cannot easily be washed away. Nursing is interfered with on account of the pain they cause.

Treatment.— Prophylactic.— The proper care of the infant's mouth (see p. 170) and the early treatment as in thrush.

Locally.— The application daily of a 2 per cent. solution of silver nitrate, which is neutralized by salt solution, will readily effect a cure.

Perlèche.

This is an ulcerative process superficial in character which appears at the angle of the mouth of children of school age.

Radiating fissures first appear at the corners of the mouth which are brownish-yellow in color, and soon become covered with desquamating epithelium. A gummy exudate contracts the angles, which readily bleed if stretched. Licking the lips, no doubt, infects these areas, and prevents healing. Contamination to others in the family is occasionally observed.

Treatment.— Proper advice as to contact infection by kissing, food utensils, etc., is to be given.

Locally, the area is thoroughly cleansed and swabbed with silver nitrate 2 per cent. or burnt alum. An antiseptic powder such as bismuth subgallate may then be applied.

Mycotic Stomatitis.

(*Parasitic Stomatitis, Thrush, Sprue, Soor, White Mouth.*)

Definition.— This is a local mouth disease produced by the growth of a specific cryptogamic fungus.

The affection occurs most frequently in early infancy. The children of the poor, because of parental ignorance or neglect, are prone to the disease. Badly or improperly fed infants are subject to this affection because of the greater liability to uncleanliness in the feeding apparatus. Marasmic and atrophic infants seen in hospital and dispensary practice, seldom pass through the first few mouths of life without contracting the disease.

Specific Cause.— Under the microscope a small particle of the growth appears as a matted fungus microorganism, made up of shreads, composed of jointed filaments. Spores are found at the junction of the filaments, which reproduced the growth. This particular fungus has not as yet been properly classified.

Symptomatology.— Small rounded white masses appear on the mucous membrane of the mouth. The tip of the tongue, and next the cheeks and gums are affected. In exceptional instances remoter areas of the gastrointestinal tracts, as the esophagus and stomach, are involved.

As the masses fuse, the characteristic appearance, *i.e.*, a whitish coating resembling milk curd, is seen in the mouth.

The masses, if an attempt is made at removal, come away with difficulty, leaving a reddened surface beneath. As the disease progresses, the infant has difficulty in feeding and will be restless and peevish. There is rarely any constitutional disturbance or rise of temperature. Occasionally there will be concomitant irritation of the alimentary tract with the production of vomiting and abnormal stools. If the reaction of the mouth be taken with litmus-paper it will invariably be found acid in reaction. Exfoliation of the pellicles take place after a week or ten days, leaving the mucous membrane reddened and glistening.

Course and Prognosis.— The affection lasts from a few days to a week at the most. The exceptions appear in infants with constitutional diseases in which thrush appears as a complication; in these it may persist for a long time or add to the fatality of the case.

Treatment.— Prophylactic.— Thrush does not appear in those infants who have been properly cared for. The essential prophylactic measures are constant supervision and great cleanliness of the infant's utensils, which should be boiled and kept for the one infant only; washing the mother's nipples, avoidance of harsh mouth washings, removal of soiled clothes and diapers, and absolute restriction of all manner of comforters or soothers. The diet must be carefully regulated, as infants suffering from this disease have nearly always been wrongly fed. (See section on Infant Feeding.)

Local.— Swab with a 2 per cent. or a saturated solution of boric acid (avoid the honey and boric preparations), three or four times a day, and follow with copious washing of sterile water. This is curative and soothing. In stubborn cases swab once with a weak formalin solution (1/100) and then use the boric wash. Sodium sulphite dram one to two ounces of water may be used after each feeding. If the nipple is refused, feed with a dropper for a few days.

Ulcerative Stomatitis.

(*Stomacacæ, Putrid sore mouth.*)

Etiology.— This form of stomatitis is found after the second year of life, when the teeth have erupted and caries or neglect of the teeth has taken place. It follows the infectious diseases, especially measles, and results from the lowered resistance that the previous disease has imposed. Bernhem and Pospisil have isolated a bacillus and a spirochæte, which they find quite constantly in ulcerative stomatitis, and they have been able to prove a distinct etiological relation. Minerals, such as mercury and phosphorus, are able to produce an ulcerative stomatitis through their irritative action.

Symptomatology.— Attention may be attracted to the child because food is refused and pain is caused by attempts at eating. The breath is foul. The tongue is coated. The children are irritable and sleep poorly, There is a low-grade temperature. They become weak and depressed from lack of food. The examination of the mouth shows the gums at first to be swollen and red. The lower jaw is commonly involved at some point situated on the edge of the gums. A purulent exudate is then formed that goes on to necrosis and the formation of an ulcer. As a rule, the preliminary stages are not observed. An ulceration on the gum margin which spreads even to the buccal portion of the gum is the usual picture. In aggravated cases the tooth is exposed and loosened in its socket. The odor is distinctly fetid and quite characteristic of this form of mouth disease. Drooling is pronounced. The cheek and lips may also be involved by contact, and even necrosis of the jaw may follow in the pathological process. The neighboring lymph-glands become hypertrophied.

Course and Prognosis.— The prognosis depends greatly upon the vitality of the child. In poorly nourished, anemic children, it may run an obstinate course of several weeks. As a rule, it begins to clear up after the first week.

Differential Diagnosis.— The almost typical picture, with the fetid breath, salivation, and localization on the gums, stamps the disease quite clearly. In gangrenous stomatitis we have marked and early constitutional symptoms and prostration, with a limited dark, purplish area of tissue involved.

Treatment, Local.— The mouth should at once be carefully flushed with a mild antiseptic, such as boric acid or peroxid of hydrogen well diluted. Remove the offending carious tooth if present, and then use chlorate of potash locally (and also internally, see below), four grains to the ounce, applied carefully with a brush or cotton applicator. Silver nitrate in a 1 per cent. solution locally, is serviceable, if the process is obstinate. If necrosis of bone has taken place, surgical intervention is necessary and should not be delayed.

General.— The nutrition should be rigidly kept up and detailed feeding lists supplied. Milk and eggs made palatable (see diet lists) should be forced if necessary. An antiscorbutic diet, such as is described under infantile scorbutus is particularly serviceable in these cases. Medicinal treatment is confined to the use of the chlorate of potash in 2- to 3-grain doses, three or four times a day. It is better not to write for more than a three-ounce mixture, as the potash may affect the kidneys if given for too long a period.

Gangrenous Stomatitis.

(*Noma, Cancrum oris.*)

Definition.— A rapidly developing and usually fatal gangrene, beginning in the cheek.

Etiology.— No specific organism has as yet been satisfactorily proven as the causative agent. The disease occurs in children only, most often between the ages of two and five years and rarely in nurslings. Children living in bad hygienic circumstances that have had their resistance much lowered by previous diseases, especially those that have been confined to hospitals and asylums, are more prone to the affection. It may follow measles, diphtheria, typhoid, ulcerative stomatitis, scarlet fever, enteritis, pneumonia, pertussis, tuberculosis, etc. The greater number of cases occurring in this country have followed severe cases of measles, and in the epidemic form in institutions, it may there even follow mild cases.

Symptomatology.— A putrid odor from the mouth may be the first symptom to attract attention. Inspection may then disclose a stomatitis as a forerunner. In other cases there is first observed a swelling of the cheek, which is hard, shining, and pallid. Pain is not caused by the examining finger. The inner surface of the cheek may show the original site of the infiltration and at this point an ulceration is observed. The submaxillary glands, if not as yet affected, soon hypertrophy. The infiltrated area in the cheek now becomes dark red, and soon is bluish and later black in color. The fetor increases. A line of demarcation now appears about the dark area and spreads upward to the eye and outward toward the ear. A punched-out area soon appears, permitting inspection into the mouth. The gums are correspondingly affected, being covered with greenish-gray slough.

The periosteum may be separated. The teeth are loosened or even drop out. There is seldom any bleeding because the process is a gangrenous one. The stench is now almost intolerable.

As may be supposed, the general condition soon suffers from such a destructive process. The pulse and temperature are elevated — 102° to 104° F.— with a correspondingly weak pulse.

While at first nourishment is taken and little pain complained of, soon the patient succumbs and is badly prostrated. Signs of exhaustion are apparent. Patches of bronchopneumonia or a diarrhea complicate the disease. A comatose condition with septic rises of temperature usher in the fatal ending.

In certain cases in female infants the necrosis involves the vulval ring, which may soon completely slough out.

Course and Prognosis.—The course is rapid: the disease may end in a week or it may last three weeks from its inception. Only 15 per cent. of the cases recover (Moro). Those that do live are left with severe deformities of the face.

Treatment.— Strict attention to the nasopharyngeal toilet in the infectious diseases will tend to prevent this affliction.

The early and complete extirpation of the diseased area and cauterization of the edges is the modern treatment adopted by the surgeons, and the results achieved warrant its recommendation. Wherever possible, attempts should be made to save the angle of the mouth to prevent a disastrous deformity. Loosened teeth or necrotic alveolar structure should be removed.

Meanwhile, the internist will flush the mouth with a 2 per cent. solution of peroxid of hydrogen, or swab with a 5 per cent. solution of nitrate of silver, followed by salt solution.

Nourishment should be forced and stimulation in the form of brandy and strychnia given. Turpentine spirits, if kept near the patient, will mitigate the nauseating odor.

Elongated Uvula.

Although rarely observed, this condition has led to much improper medication for persistent cough. The elongated uvula irritates the pharynx and causes a cough which is especially marked when the prone position is assumed or when the child is overtired. If the chest is negative, this condition should be thought of. Treatment is by astringents, applications of silver nitrate, but usually amputation is indicated and necessary.

CHAPTER XVIII.

DISEASES OF THE DIGESTIVE TRACT.

Corrosive Esophagitis.

Etiology.— This condition is caused by the swallowing of caustic chemicals, such as potash and sulphuric acid, which produce corrosive burns of the esophagus. Lye is the most common substance ingested by children. The lesions vary. There may be an intense acute inflammation, a necrosis of the mucous membrane, or extensive ulcerations which produce cicatricial strictures in healing.

Symptomatology.— If much caustic has been swallowed, death may shortly result; otherwise there is prostration and vomiting of shreds of bloody mucus, or even pieces of mucous membrane may be expelled. The child cannot swallow without pain. An erosive hemorrhage may occur after a day or two, or a deep-seated cellulitis may result with infection. A stricture is very likely to develop in severe cases.

Treatment.— Appropriate antidotes are to be given if the patient is seen early; such as the acids or the alkalies, depending on the character of the poison. The prostration must be combated by supportive treatment, hypodermatic injections of camphor or strychnia. For the intense pain, codein subcutaneously will be indicated. Olive oil thrown into the esophagus is a distinct advantage, and if the child can swallow, this should be regularly administered. The treatment of the stricture is surgical. The string method has given some brilliant results in cases coming under our observation. Gastrostomy may be necessary to preserve the life of the child if sudden occlusion of the esophagus results.

Congenital Occlusion of the Esophagus.

This condition is rarely observed. Difficulty in swallowing and the regurgitation of even the smallest quantities of food should lead to an investigation with the bougie. The atresia or stricture is usually situated at or near the bifurcation of the larynx.

Acute Gastric Indigestion.

(*Acute gastritis, acute dyspepsia, acute gastric catarrh.*)

Etiology.— Errors in diet are the principal cause. In infancy the quality and quantity of the milk, or the irrational use of extraneous articles added to the dietary act as causes. Improper feeding habits will bring on occasional attacks. Sweets, unripe fruits, and pastries in older children or even large quantities of one kind of food may produce an attack. Usually there is more or less involvement of the intestinal tract.

Symptomatology.— The symptoms very often begin suddenly with fever, headache, abdominal pain, and vomiting. The temperature may reach 104° F. with a correspondingly high pulse rate. The vomiting is repeated several times, and the evidences of undigested food, or a certain article of food which has caused the attack, as unripe fruit, are seen therein. The patient is chilly at times and apt to be sleepy. Food is abhorrent, the tongue is coated with a thick fur, and the breath is disagreeable. Occasionally convulsions occur, especially in neurotic children. After the vomiting has ceased or a (compensatory) diarrhea has set in, there is relief from the distressing symptoms, although nausea and vomiting may reappear if the child is pressed to eat.

Prognosis.— This is usually very favorable, although the onset of convulsion in a weakly infant would warrant a guarded prognosis.

Treatment.— In breast-fed infants, examine the mother's milk, and give plain boiled water until vomiting and fever have subsided; a cleansing enema will complete the cure if the milk is not permanently abnormal. Bottle-fed infants suffer often from this malady, and the food formula and its preparation should be inquired into most minutely, for well-intentioned attendants often make grievous errors. Calomel gr. i in divided doses every ten minutes will clear the bowels. If there is a convulsion, clean out the bowels at once with an enema and later wash out the stomach if vomiting has not been free. In all cases the patient should be put to bed, without a pillow, and a mustard paste applied to the epigastrium in the strength of one to seven of flour. The fever is controlled by sponging with alcohol and water. Dietetic management is very important. Infants may be kept on albumin water, cereal decoctions, or whey, and then gradually returned to their regular feedings. Older children are not allowed to take any food for twelve to twenty-four hours, except sips of cold water. Then beef tea, toast, and crackers are allowed and later milk, milk toast, etc., slowly returning to the regular diet.

Gastric Ulcer.

While this disease is not of frequent occurrence during childhood, it may happen at any period of life, even during infancy. Stowell has collected thirty-five cases from birth up to puberty, the earliest at five days, and six during infancy.

Etiology.— The following conditions may act as causes: Hyperacidity of the stomach with spasm of the pylorus, swallowing sharp substances with resultant local injury, various infectious diseases and septic conditions following birth, extensive burns; thrombosis of the umbilical vein and embolisms in the stomach wall.

Pathology.— In young infants there may be melena, usually from sepsis, and blood may be passed in the stools presenting a dark appearance from iron sulphid produced from the hematin of the hemoglobin.[1] The ulcer may be located in any part of the stomach, but is most commonly situated in the lesser curvature. In cases that perforate, the site is most often on the anterior wall.

Symptomatology.— During infancy the principal symptom may only be a constant gastric irritation and indigestion with occasional hematemesis, or the vomitus may simply be streaked with blood. If there is sufficient blood to pass into the bowel, dark, coffee ground masses may appear in the stool. Vomiting, however, is not such a constant symptom in early life as in adults. Pain is a fairly uniform symptom: It is aggravated at once by taking food, especially sugary or rich preparations, and relieved by vomiting. Pain can also usually be elicited by pressure over the stomach. The imperfect digestion and disinclination to take food soon result in progressive emaciation. Constipation is often present and profound anemia may result if healing does not soon take place. If perforation or severe hemorrhage occurs, there will be the usual symptoms of marked collapse.

Diagnosis.— This must depend upon constant gastric irritability, blood in vomitus or stools, pain immediately after food which is relieved by vomiting, and pain on local pressure. Jacobi has given the following interpretation of the relation between pain and the ingestion of food: Pain half an hour or an hour after food points to duodenal ulcer, or peritonitic adhesions of the duodenum; pain three or four hours after a meal may be referred to the colon; pain most marked when the stomach is empty and relieved by food usually indicates a neurosis.

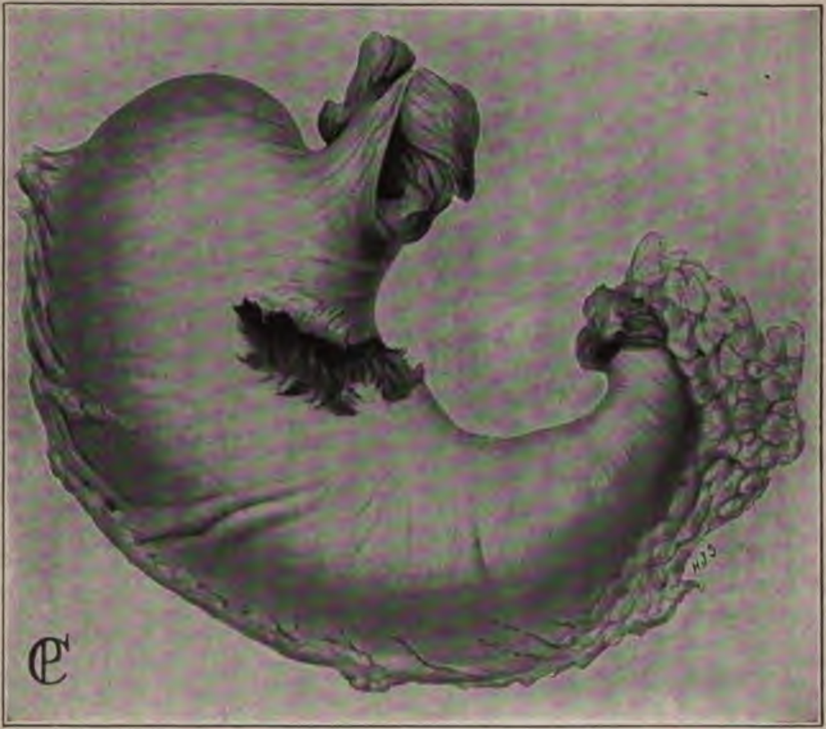


FIG. 52.— Ulcer on lesser curvature: infant 7 months old.

Treatment.— The patient should be given easily digested food in small amounts at frequent intervals. Peptonized milk or skimmed milk and gruels, buttermilk, dextrinized gruels, light cereals and egg water may be tried. The acidity of the stomach may be lessened by the simpler alkalies, such as calcined magnesia, milk of magnesia, carbonate of lime and similar preparations. The stomach may be partially rested by rectal feeding. If pain is severe, bismuth subcarbonate and small doses of codein may be employed. In cases of perforation, surgical treatment is indicated. This, fortunately, is rare.

Chronic Gastritis.

Definition.— A chronic disturbance of the gastric function, associated usually with a similar involvement of the intestinal tract.

Etiology.— Improper feeding at irregular intervals is the main cause, especially when coupled with bad hygienic living. Rickets, tuberculosis, and chronic affections of the liver predispose to a chronic gastritis. Among pampered children it results from the use of sweets, pastries, and rich dressings which the child is allowed to have.

Symptomatology.— Frequent vomiting first attracts the attention of the parent. This after a time follows each meal. There are eructations of gas and a feeling of discomfort after eating. The tongue is coated. The appetite is capricious. The outline of the stomach shows a well-marked dilatation. The abdomen remains quite persistently distended in spite of medication. The child is fretful and restless in sleep; the weight falling off gradually in aggravated cases. In infancy the picture of marasmus may be seen. Periods of prostration and collapse may precede a lingering death. Older children show no inclination to play, slowly grow more feeble and flabby; mucus is seen with greater regularity and in greater quantity in the vomitus.

Diagnosis.— From a basilar meningitis the disease may be distinguished by the absence of stupor or coma and lack of reflex changes. In doubtful cases the Von Pirquet reaction or a study of the spinal fluid could be resorted to for verification. Pyloric stenosis should be excluded by careful physical examination and the character of the vomiting.

Course and Prognosis.— The disease may last for weeks and the child drag on a miserable existence until it succumbs to a terminal disease, such as bronchopneumonia or marasmus. Infants rarely withstand the disease, while if they survive they are apt to be weak and puny. In older children the prognosis is better and treatment of greater avail, although convalescence is prolonged sometimes through months.

Treatment.— If all children were brought at stated intervals to their physician for examination and counsel, whether well or ill, chronic gastritis would be a much rarer disease. "Proper food properly given" is the prophylactic treatment. The treatment is mainly dietetic. A careful history and study of the previous diet is the first requisite. Find the factor that is causing the disturbance; determine whether it is the butter fat, carbohydrates, or protein elements, for example, that is at fault. The periods of feeding, the quantity, the quality, and the digestive ability of the stomach itself must be weighed in the balance and corrective measures instituted as described in the chapter on Infant Feeding. The fact must not be lost sight of that some children cannot digest cow's milk in any form. For the correction of the vomiting and to control the failing nutrition it is necessary to supply such food as will meet the lowest nutritional requirements, and in as readily a digestible form as possible. It is well to wash out the stomach before beginning the treatment. The legume flours, as pointed out by Edsall and Miller, are excellent substitutes for cow's milk if it disagrees, and they furnish sufficient protein to keep up nutrition. Beef blood, yolk of egg, and gruels are to be tried, and if they agree, that is, cause no vomiting, may be alternated so that they will not pall on the appetite. If an increase in weight is obtained, weakened regular milk feedings may then be cautiously tried. Occasionally the stomach-tube must be used in obstinate cases. Rectal feeding is without much merit in these cases. Children two to three years old are often benefited by a change to the seashore. The appetite is thereby stimulated and the strict dietetic régime more willingly followed. A special diet list should be prepared by the physician for each case. From this should be excluded all sweets, gravies, and pastries. Milk, gruels, eggs, and the softer vegetables should be the mainstay. Coupled with the dietetic management, the daily routine of the child should be outlined. A fresh-air life, plenty of sleep, plenty of water to drink, and agreeable baths are necessities. Cases seen late or doing badly require stimulation, and this is best given in the form of the tincture of nux vomica three minims well diluted one-half hour before meals. Constipation is relieved by milk of magnesia or cascara in children or with a suppository in infants.

Dilatation of the Stomach.

Etiology.— This condition results from causes which tend to weaken the muscular walls of the stomach. It is more commonly observed in infants suffering from constitutional diseases, such as rickets, marasmus, syphilis, and tuberculosis. Among the rarer causes are pyloric hypertrophy or stricture.

Symptomatology.— Those which result in the course of the constitutional diseases will be here described. Vomiting occurs usually some time after meals; food is not taken with avidity, and later in the disease may be abhorrent. Constipation is a noticeable symptom. The abdomen is usually tympanitic, tongue coated, and in older children headaches may be complained of.

Physical Examination.— In emaciated subjects the greater curvature of the stomach may be seen on inspection. The abdomen is generally prominent, but percussion over the dilated viscus gives a highly resonant tympanitic note. If fluid is present a succussion note can be obtained by tapping with the ends of the fingers. If the diagnosis is still indefinite, water or air may be introduced as an aid in determining its size and capacity.

Prognosis.— Unless due to a congenital stenosis, the prognosis is fairly good, but the course is slow and dependent upon the underlying disease. In itself the condition may retard the progress of a case of rachitis, for example, or even become the factor that may lead to a fatal termination.

Treatment.— The motor inactivity necessitates in the beginning a course of gastric lavage coupled with dietary regulations as outlined under the article on Chronic Gastrit [illegible] ge, electricity, or vibration will be additional aids, no matter what the underlying disease. The tincture of nux vomica in small doses will stimulate the appetite and assist the motor functions. If the disease is dependent upon a stricture, radical measures may be necessary to effect a cure.

Stenosis of the Pylorus and Pyloric Spasm.

(*Congenital hypertrophy of the pylorus.*)

This is a condition in infancy in which there occurs an obstruction to the passage of food from the stomach as a result of hypertrophy or spasm of the pylorus.

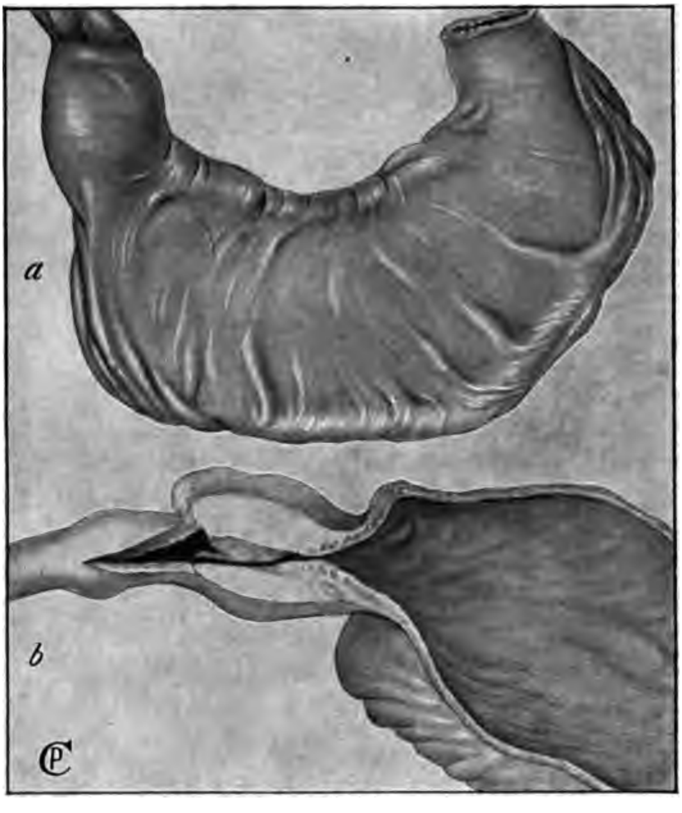


FIG. 53.— (*a*) From a case of congenital hypertrophic pyloric stenosis: infant six weeks old — seen by one of us. (*b*) section of tumor in same case.

Etiology.— There are no positive etiological factors known.

Pathology.— The muscular, and occasionally the connective tissue at the pylorus, is hypertrophied. The stomach is dilated and thick tenacious mucus is found on the mucous membrane.

Symptomatology.— The disease is usually not recognized when the first symptom appears. An apparently healthy infant at the breast may begin to vomit after nursing. This being repeated at frequent intervals, advice is sought. The usual corrective measures do not suffice and the vomiting is more persistent. Closer observation will show that the stools are extremely small, that the urine is scanty, and that the vomitus is projectile in type. The diagnosis now becomes more apparent. Physical examination may show a thickening about the pylorus, especially if anesthesia is used, but this is not always present. The cases of simple pyloric spasm do not give evidences of tumor formation; the vomiting is not quite so persistent, and the emaciation not so rapid.

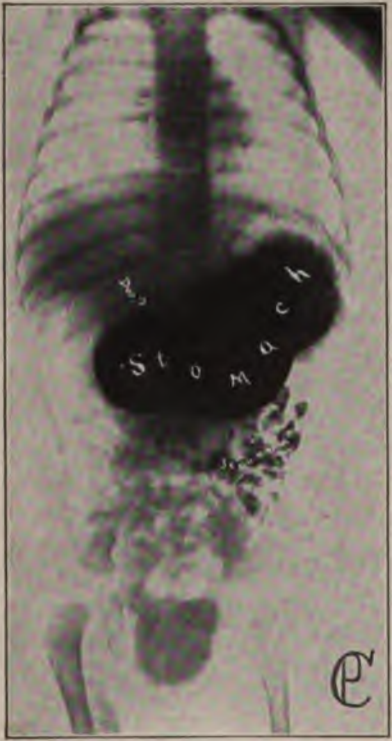


FIG. 54.— Wave in a case of pyloric obstruction.

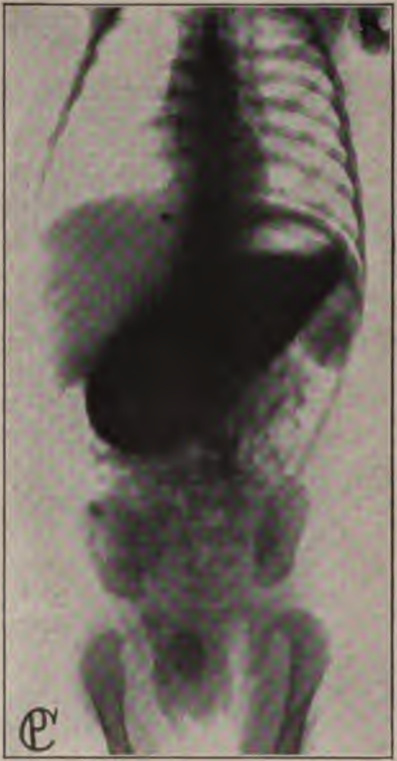


FIG. 55.— Pyloro-spasm: little food only has been extruded as compared with normal stomach.

The stools are small and like dry putty, sometimes alternating with diarrhea. Owing to the obstruction, little or no chyme enters the duodenum, and progressive emaciation results. The stomach is dilated, but the intestines are collapsed, a valuable sign in this disease. A peristaltic wave may be observed passing from left to right upon slight mechanical stimulation. Examination of the stomach contents shows a mixture of food and mucus, but without any bile. Hyperchlorhydria may be present. If measures for relief have not been successful the child dies of starvation.

Diagnosis.— The characteristic vomiting without dietetic error, visible peristalsis, and a palpable tumor are of especial diagnostic importance. If to these are added the sunken abdomen and progressive emaciation, the diagnosis should be more certain.

Course and Prognosis.— In cases of true stenosis, due to hypertrophy, the course is progressively downward and, unless there is successful intervention, ends fatally in six to ten weeks. Cases that have been cured by medical treatment alone are probably those in which there was spasm only present and not a true stenosis. It is certain that the older the infant becomes before symptoms appear, the better its chances for recovery.

Notable achievements have lately been made in Roentgenology, especially with the use of bismuth in the alimentary tract.

The fact that we may be able to observe the exit of food into the duodenum within a minute or two after its intake rather tends to show that we may have been overvaluing this portion of the alimentary tract.

That liquid foods begin normally to be expelled in a very short time after they are taken into the stomach is very helpful in our diagnosis of conditions dealing with some form of pyloric obstruction, for, if we can demonstrate, with a degree of exactness, by a series of radiographs, that the milk is retained for a greater length of time than in a normal stomach, as shown by the bismuth shadow, we can determine with a fair degree of certainty with what type of obstruction we are dealing. If such striking results can be obtained by this means, it would seem manifestly unfair not to early obtain a series of radiographic pictures in every suspected case, so that the infant, suffering from a true tumor with a lumen so small as to practically occlude the passage of food into the duodenum may be early given over into the hands of the surgeon while its physical condition is still good. On the other hand, cases of pyloric spasm, even of marked degree, but without tumor formation, can be differentiated, since the time and the amount of the food passing through the pylorus can be seen and thus the diagnosis, and even the prognosis, can be fairly well fixed.

In every suspected case of pyloric obstruction a radiographic study should be made before a plan of treatment is determined upon.

Treatment.— As soon as the diagnosis is made, stomach washing should be regularly done twice a day with bicarbonate of soda, one dram to the pint. The food, preferably breast milk, should be fed by gavage and always after the stomach washing.

Cyclic Vomiting.

(*Recurrent Vomiting, Periodic Vomiting.*)

This symptom-complex occurs in older neurotic children and is characterized by periodical attacks of vomiting and prostration, usually without fever and without marked indiscretions in diet.

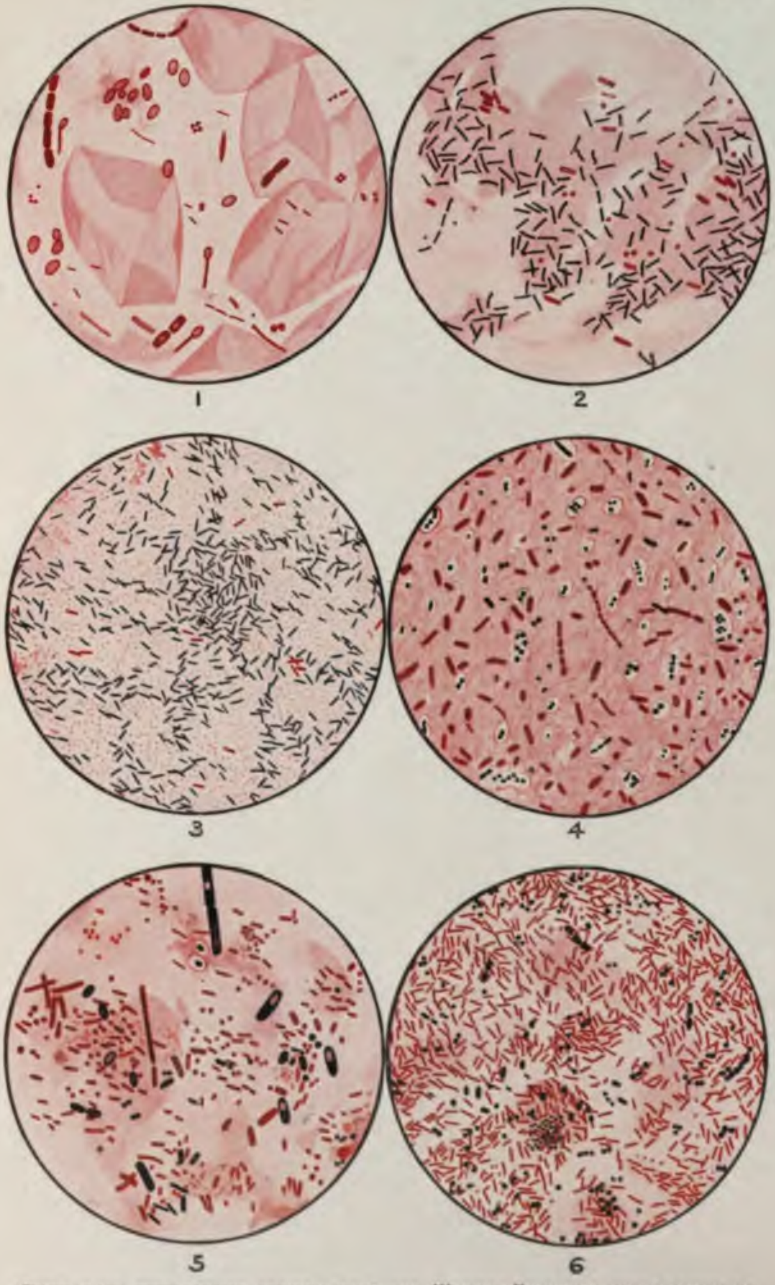
Etiology.— The condition is usually ascribed to some form of toxemia. Children from five to twelve years of age are more frequently affected. It is more apt to occur in the families of the well-to-do than in the poor. Metabolism is disturbed, as shown by the presence of the acetone and diacetic acids in the urine. Edsall believes that in the majority of cases faulty digestion is the underlying factor.

Symptomatology.— In cases already under observation, a prodromal stage may sometimes be detected, but for the most part the attack comes on suddenly in children who are considered to be in good health. Occasionally constipation, lassitude, loss of appetite and a slight temperature precede the attack. The vomiting is persistent, recurs frequently and sometimes contains blood; nothing is retained. The child soon shows the effects of the strain, lying quite prostrated with sunken eyes, anxious expression, coated tongue, sweetish breath, and a high pulse. Thirst is a prominent symptom and cannot be relieved on account of the vomiting. The abdomen becomes scaphoid in shape, and sometimes is sensitive to the touch. Constipation is almost the rule. There may be periods in which vomiting ceases for a short time and some fluid or food can be temporarily retained. The attacks recur in varying periods — it may be weeks or months. The urine when examined is found deficient in amount and clouded, and usually gives a marked acetone reaction. Indican, diacetic acid, and occasionally albumin, and casts are found. Recovery is quite rapid when the attack has ceased and food can be retained.

Diagnosis.— This must be made after excluding acute gastritis, meningitis, nephritis, and appendicitis. The sudden onset, acetone breath, absence of high temperature in a child without a history of dietary indiscretion, would call attention to this symptom-complex.

Prognosis.— As to life, the prognosis is distinctly favorable, although a few fatal cases have been reported. The attacks tend to recur unless the underlying cause be removed.

PLATE B.



COVER-GLASS PREPARATIONS STAINED WITH THE WEIGERT-ESCHERICH MODIFICATION OF GRAM'S STAIN (× ca. 1000).

1. Meconium. 2. The blue bacillus of Escherich. 3. Fæces of a breast-fed infant.
4. Fæces of a bottle-fed infant. 5. Fæces of an adult on a carbohydrate diet,
6. Fæces of an adult on a meat diet.

By permission, from Cammidge, "Examination of Fæces."

Treatment of the Attack.— Rest of body and stomach are essential; nothing should be given by mouth. To allay the thirst, colonic irrigations of normal salt solution, allowing four to six ounces to be retained, are effective. If the attack persists beyond the second or third day, codein hypodermatically may be necessary, followed by nutrient enemata of peptonized milk and whiskey. Four to six ounces or 4 per cent. dextrose solution may be given hypodermatically with good effect in markedly prostrated cases. Small doses of carbonated water may be tried when the vomiting begins to abate. Later, hot broths, dextrinized gruels, orange juice and semisolid food is offered until convalescence is established.

In the Interval.— This should be influenced by the family history, the dietetic faults, and an examination of the urine. The child should be under constant medical supervision. A suitable diet should be prepared and its effect on the urine noticed. School work must be lightly undertaken, and parties and strenuous playmates prohibited. The bowels should never be allowed to become constipated. A specific amount of water should be given daily. The daily life of the child must be apportioned, as in this way only, may we hope to prevent recurrences. If the child has ever had an attack of appendicitis, this structure should be removed.

Stools.

The stools of the breast-fed infant may be from one to five in number, and numerically we should not judge them as abnormal, provided their color, consistency, and odor are within the normal limits. Their color should be a yellow or orange tint with homogeneous consistency produced by the unchanged bilirubin. Their reaction should be acid and the odor not disagreeable. The amount of residue found in the stools will be in direct proportion to the amount ingested or retained. The latter statement, however, does not hold true for the babies artificially fed.

Stools of Artificially Fed Infants.— Cow's milk normally produces a stool lighter in color, bulkier, and numerically fewer. The feces amount to about 5 per cent. of the food ingested. In the hand-fed infant the protein elements are longer exposed in the intestinal canal to putrefaction.

Examination of Stools.— If we examine a freshly passed stool from an infant fed on human milk (See Pl. B, fig. 3), and with an improvised spatula spread out a central portion, we may find that there are yellow masses or flakes present; these are often mistaken for curds, but in reality are made up of fats; firm, hard curds are not found in mother's milk — only in cow's milk. Such a stool in an infant not steadily gaining would indicate a scanty milk supply, and if the stools were frequent, dark green and mucoid, with very little milk residue, the maternal font would surely be found to be at a low ebb. The indication would be wet-nursing or alternate feedings and regulation of the diet and life of the nurse.

In the bottle-fed baby we are often confronted with the symptoms of constipation or diarrhea. Either of these conditions may arise from too much protein in the food. The constipated stool will be friable, like dry putty, while the loose stool due to this cause can be smoothed out and the masses will be readily soluble in ether, proving them to be fat and not curds, as they are so often designated.

True curds are formed in the stomach by the action of lactic acid or an excess of hydrochloric acid and rennet on the paracasein. They are hard, smooth, yellowish on the outside and white within, with a cheesy odor when opened, and will not dissolve in ether. The remedy for too much protein is evident. Correct the formula, and if true curds are present, examine the character of the milk. The milk may have been sterilized or it needs to be mechanically diluted with gruels, or chemically modified, when the stools will assume the normal type. A loose, greasy, sour-smelling, acid movement, resembling scrambled eggs, will indicate excessive fat in the dietary. Examination of the breast milk or a study of the formula will show that the fats ingested have been persistently too high. Three per cent. of fat should never be exceeded by an infant to the third or fourth month, and more than four per cent. should never be prescribed. It should be recollected that a certain amount of fat is always present, but should not be visible in distinct masses.

Mothers often erroneously speak of large quantities of mucus as present in the baby's stools. The doctor must remember that some mucus is normal; that it should, however, be found intimately mixed with the feces. Barley water produces a slimy stool often mistaken for mucus, and undigested food elements also cause this error. If mucus is seen in any quantity with the naked eye by a competent observer, it is pathological and means inflammation, usually located in the large intestine, of a subacute or chronic form. If the disease is in the small intestine, the mucus is mixed with the stool and it is usually found to be bile-stained. The hint for correction is embodied in the following fact—that the greater the amount of nonassimilable substances present, the greater the amount of mucus. The color of the stools when immediately passed should be considered. If the absorptive process has been delayed and putrefactive changes have taken place in the protein element, the bilirubin will be changed to biliverdin, but it is not known whether the reaction itself, or chromogenic bacteria, produce the coloration. Nitric acid [illegible] whether or not we are dealing with bile salts by the familiar play of colors. The green color in conjunction with mucus, and fecal acid reaction, indicate true intestinal disease and call for radical change in the dietary. Acid fermentation will require such temporary food as albumin water for its correction, while alkaline putrefaction will respond to the carbohydrate foods, as dextrinized gruels. The brownish movements often seen, if we exclude certain drugs and blood, are due to the ingestion of undextrinized starches alone, or a preponderance of carbohydrates in proprietary infant foods (See Pl. B, fig. 5).

A stool that presents a foamy, bubbling appearance and is acid in reaction will signify the presence of too much sugar in the mixture, as is often the case in canned condensed-milk feedings.

We have not hinted at the bacterial examination of the stools, as it has proven of no clinical value as yet. The reaction of the stool is a help and should be ascertained, and always taken from the middle of the fresh stool. If a blue color is obtained, we have alkaline protein putrefaction going on, and if the color of the litmus is unchanged, we have acid fermentation due to the breaking down of the fat and carbohydrates. (For further tests see page 49.)

Again, the stools may be of considerable aid to us in certain pathological conditions, as illustrations of the intensity of the process in the summer diarrheas, and in such pathological states as intussusception, in which we have frequent paroxysmal discharges with blood and mucus, but no feces. Rectal polypi should be strongly suspected where we have a normal stool, except for a fresh-blood coating; these hemorrhages being intermittent in character and not necessarily connected with a hard or scybalous mass. Fissures may be produced by hard fecal masses and have a blood coating, or in their passage produce bleeding from the rectum. Dark grumous blood mixed with the feces is indicative of hemorrhage, higher up in the bowel — probably from intestinal ulcerations. In gastric or acute duodenal ulcer there is vomiting of blood and mucus, but there is no fresh blood in the stools.

Colic.

(*Enteralgia.*)

The term colic is used to designate the paroxysmal pains which occur in the abdomen. It is a symptom and not a disease, and usually denotes the presence of an abnormal amount of gas in the intestines, which stimulates undue peristaltic movements.

Etiology.— It occurs most frequently in artificially fed babies, as a result of digestive disturbances dependent upon the food ingested. This food may have been unwholesome, too great in amount, or one of its constituents may have been in excess. For example, the percentage of proteins in a given mixture may be too high, or the sugar may cause fermentation if present in undue amounts (beyond 6 per cent.), or there may be starchy indigestion. Breast-fed infants may suffer from a poorly balanced milk or from overfeeding or too hasty nursing.

Colic occurring in the course of other disease is dependent upon the resulting atonic condition of the intestinal walls.

Symptomatology.— The attacks come on suddenly, the infant is restless and uneasy, and cries unceasingly. The abdomen is distended and rigid and the thighs are drawn up over the abdomen. The extremities may be cold. If during the examination some flatus is expelled the screaming ceases and the evidences of relief are apparent.

Treatment.— In the attack, heat should be applied to the abdomen, an enema of warm saline solution should be given and sips of hot water given by mouth. These measures will usually be effective. If relief is not obtained, massage of the abdomen with warm olive oil, followed by a hot colonic irrigation containing two drams of the milk of asafetida to four ounces of water can be used.

The following prescription may be of occasional service:

℞. Chlorali hydrati	gr. viii
Sodii bicarbonatis	gr. x
Sodii bromidi	ʒss
Aquæ menthæ pipertæ	℥ss
Aquæ	q. s. ad ℥ij

Misce et signa.— Give a teaspoonful in a little hot water every two or three hours.

The further treatment resolves itself into efforts to discover the cause of the colic. The details of the preparation and administration of the infant's food may disclose a fault worthy of correction. The care of the mother or wet-nurse must not be forgotten when colic is present in the breast fed.

Acute Gastroenteritis.

(*Summer Diarrhea. Summer Complaint. Infectious Diarrhea.*)

Etiology.— Artificially fed babies in the hot, humid summer months are especially prone to this infection, superinduced by the ingestion of unwholesome milk. Infants and children under two years are mainly attacked. The children in the tenement-house districts of our large cities show the greatest morbidity to infectious diarrhea. Although a lowering of the body resistance by the heat serves to produce the disease, the specific factors are organisms of the bacillus dysenteriæ type, gas bacilli, colon, strepticoccus and the pyocy[illegible]llus. The bacillus dysenteriæ (Shiga-

Flexner bacillus) can be isolated from many of the stools. The infection is usually from without, but autoinfection is possible. The lack of refrigeration, the feeding of food unfitted to the age, plus the devitalization by the summer heat, makes infection easy and common. Babies in crowded hospital wards may become infected by careless handling of the soiled diapers.

Pathology.— No special characteristic may be observed at necropsy, except a congested mucous membrane in the stomach and small intestine, with enlarged lymph glands. As a rule the Peyer's patches and solitary follicles are prominent with occasional ulceration of these areas. It is rare to find lesions outside of the large intestine and the last section of the small. Cloudy swelling of the kidneys is quite constant.

Symptomatology.— Mild Form.— The stools first attract attention. They are curdy, loose and somewhat foul. Soon mucus and blood-streaked fecal matter appear; the child is restless, loses its desire for food, and may vomit if the food is urged. The fever is moderate and the child fretful. The character of the stools soon changes to a greenish-yellow, and they become more numerous, five to six a day, and the fever rises to 102° or 103° F. If prompt measures, as indicated below, are taken, recovery is rapid and quite certain.

Severe Form.— Here the onset is quite sudden, and the predominating symptom is the marked diarrhea. The numerous small, green, foul-smelling stools, often with a putrefactive odor, contain much mucus and are blood streaked. Restlessness and pain disturb the sleep, and the child rapidly becomes emaciated. After a few days, if the numerous stools continue, tenesmus and vomiting ensue, the patient often refusing any food. The abdomen becomes sunken and the rectum is apt to protrude from the frequent movements, the fontanel in infants becomes sunken, and the pulse thready, the fever rises to 104°–105° F. with few remissions, the urine becomes diminished, and symptoms of meningeal irritation may supervene. Except for a moderate increase in the polynuclears, fifteen to twenty thousand, the blood offers nothing characteristic.

Toxic Form.— From the onset the symptoms are unusually severe. High fever and intense prostration are added to the incessant vomiting and frequent stools. The color of the stools is constantly green, the odor extremely foul, and blood-streaked mucus appears early. Cerebral symptoms soon supervene, delirium and coma usher in the end, which may come on in a day or two, or even within twenty-four hours. In this form the Shiga bacillus can usually be demonstrated.

Course and Prognosis.—This has been indicated under the separate divisions, depending upon the severity of the infection. If seen early, the mild and severer forms are amenable to treatment, although a guarded prognosis is always advisable. The toxic type is apt to baffle even the most heroic measures. The ability to command good nursing and later change of climate naturally influence the prognosis. Cases responding to treatment usually clear up within two weeks. The previously enfeebled infants may go on to a condition of chronic gastro-intestinal indigestion. (See page 194.) Signs of meningeal irritation (meningismus), prolonged high fever, uncontrollable vomiting, or convulsions indicate a grave prognosis.

Treatment. Prophylactic.—Breast-feeding whenever possible, especially in the summer months, is desirable. Cleanliness and care in every detail of the child's diet and clothing are necessary. The use of pasteurized or constantly refrigerated clean milk is indicated. Proper disinfection of stools and the nurse's hands must be insisted on. Regulation of the diet, according to the heat and the condition of the infant, will help in prevention. Weak infants are more susceptible in the second summer.

General Management.—Place the patient in the coolest, cleanest and largest room possible. A cotton slip and diapers only are to be worn in hot weather. Secure a competent nurse to intelligently follow orders. Reduce the fever by frequent cool sponging with a fifty per cent. alcohol solution, or by tepid sheet packs, or by reducing the temperature of the water used for colon irrigations to 95° or even 90° F. If the temperature is above 104° F. and the pulse permits, use an ice-bag to the head. A satisfactory initial purge with castor oil or calomel is indicated. One, or at most two, bowel irrigations of normal saline solution are to be given from a fountain bag as indicated under entroclysis (page 74). Where there is much tenesmus, starch enemata may be given. In convalescence, or in the sub-acute form, a pint of a two per cent. silver nitrate solution may be allowed to gently flow into the colon, to be retained as long as possible. For the prostration, water must be offered freely, and if not retained it should be given by the drip method by rectum, or four ounces may be given subcutaneously. When no food has been retained, much benefit can be derived by adding two or three per cent. of dextrose to the solution. This may be given four times in the twenty-four hours.

Since no dependence can be placed upon intestinal antiseptics, and since bismuth has been practically discarded, the drugs that are used are the stimulants, and very occasionally, the sedatives in the form of Dover's powder, after the toxic symptoms have subsided. Caffein, particularly in the form of sodium benzoate. [illegible] stimulant. It may be given to an infant in quarter to a half grain doses alone, or alternating with strychnin sulphate 1/240 of a grain, every four hours.

Dietetic.— Stop milk in all forms for at least twenty-four hours, placing the child on a starvation diet of boiled water alone or on barley water, made with one ounce of flour to the quart. If at the end of a day the frequent stools persist, continue the substitute feeding a day longer until a change for the better is noticed.

If barley gruel is not palatable or tolerated, one may try rice water or albumin water. (See section on Dietetics.) In the case of nurslings resume the feeding at longer intervals preceded by a dram or two of boiled water. Substitute feedings such as barley water must not be continued too long a time as the infant's life may be jeopardized by too prolonged starvation. Morse has pointed out that the character of the food offered should depend upon the type of organism producing the diarrhea. Unfortunately it is rarely practicable, except where trained laboratorians are at hand to do this. It is demonstrable, however, that cures are more readily effected if carbohydrates are offered when the infecting organism is dysentery or colon bacilli, or a streptococcus; while the gas bacillus and its prototypes do best on protein, fat-free food. (See buttermilk feeding and Eiweiss milk.) This dietetic test is suggested in outlying districts where laboratory aid is not available. When Eiweiss feedings are used the nipple must be perforated to permit the flow of the particles of casein. It is sometimes necessary to add a grain of saccharine to a pint of mixture to make it palatable. The stools change from a thin watery consistency to a heavy pultaceous mass, decrease in number, thereby adding to the comfort of the child. Unfortunately we do not meet with success in all cases, by this method. It is worthy of a trial, however, when the above mentioned directions do not succeed. The stools having in any instance assumed a more normal appearance, skimmed milk, diluted if necessary, is fed before returning to the proper modification. In artificially fed babies, resumption to cow's milk feedings must be made only when the stools begin to resume the normal type. Begin with a modification lower than the original prescriptions.

The diarrheal diseases of infancy and childhood do not permit as yet of any definite classification, for the etiological factors may be the same in a number of the allied affections, and the various pathological changes found are often those of degree or situation only. It is to be hoped that in the near future these grouped diseases may be more accurately separated and defined.

Acute Enterocolitis.

Definition.— This is an inflammation of the mucous membrane of the small and large intestine associated with ulcerations and characterized by tenesmus and blood-stained stools.

Etiology.— Children in the summer months, especially those who have had previous attacks of gastroenteritis, or who suffer from chronic indigestion, are especially liable to attack. The children of the poor in the large cities because of improper food and uncleanliness are most frequently the victims of the disease. Such constitutional conditions as rickets, tuberculosis, and syphilis are predisposing elements. The Shiga bacillus and its prototypes are found in a great many of the cases.

Pathology.— In the colon and about the ileocecal valve the characteristic lesions are commonly observed. In some of the lighter forms of the disease we find only evidences of congestion and inflammation with a roughened or somewhat denuded epithelium.

The lymphatic structures are hypertrophied or show loss of tissue. If the affection has been of a severer grade, the follicles are degenerated, producing a slight ulceration and consequent uneven feel to the gut. These changes are commonly seen in the colon and rarely in the ileum or rectum. In the usual type seen after a severe illness quite deep ulceration may exist, so as to produce a shaven beard appearance. The ulcers may later extend down to the muscular layer, and a large area of ulceration may be found by the coalition of a number of smaller ulcers. Another type occasionally seen presents a fibrinous deposit over isolated areas of the colon. Quite generally there is a swelling of the retroperitoneal and mesenteric glands. Bronchopneumonic patches are often found at necropsy.

Symptomatology.— In a child whose vitality has already been impaired by previous disease the attention may be directed to the condition of the stools, which are frequent and passed with much straining. These stools may contain blood-streaked mucus with undigested food masses. Fever is quite constant and varied in degree, in the beginning 102° to 105° F. with a correspondingly rapid pulse rate. In the severer cases there is rapid prostration and vomiting. The stools are passed with tenesmus, and abdominal pain may be marked. There is restlessness, and often delirium, with intense thirst. The eyes are sunken and expressionless. The lips and tongue are dry and coated. The stools are now frequent — from ten to twenty a day — small, and contain almost no feces. Death will occur from exhaustion or a pneumonic complication if the symptoms do not show signs of abatement. Improvement is shown by a decrease in the number of stools, a lowered temperature with absence of vomiting and tenesmus. The lost vitality is regained very slowly. For days or weeks there is a low-grade temperature, and temporarily the tenesmus or green stools may appear.

The appetite is capricious for a long time. The abdominal tone which is lost during the height of the disease will now slowly return to the normal, and the child will gain in weight.

Diagnosis.— The diagnosis is made from the presence of mucus and blood in diarrheal stools passed with straining over a period of several days or weeks in a child of deficient vitality.

Intussusception is differentiated by the absence of fever, the acute onset, the pain, the shock, the presence only of mucus and blood, but no feces, and a tumor palpable through the abdomen or rectum.

Course and Prognosis.— Severe types end fatally after a few days, or a week at most, of high fever and prostration. The mortality rate is from 30 to 40 per cent. The subacute types remain ill for a month or six weeks with periods of remission and relapses and a slow painful convalescence. The prognosis is more favorable in this class, especially if they are removed to suitable surroundings, and have proper nursing and attendance. Infants withstand the disease badly.

Treatment.— This does not differ from that given on page 188, under gastroenteritis. It should be recalled that these infections may be communicated to others in a family or ward. An initial cleansing of the bowel with castor oil or calomel is imperative, followed by starvation for twelve to twenty-four hours. Egg albumin, barley water, or beef broth may be given (see p. 144). Equal parts of beef broth or barley gruel are sometimes more acceptable. Protein milk often produces happy results (see p. 145).

The tenesmus is relieved by the control of the diet and by the use of codein gr. ⅛ to ¼, according to the age, or Dover's powder, gr. ½ to 2 grains every two or three hours, until the painful symptoms abate. Suppositories containing cocain gr. ¼ and aristol gr. 15 are soothing in older children. Bismuth subcarbonate gr. 20 or bismuth subgallate gr. 2, with powdered ipecac gr. 1, may be given advantageously every two or three hours for the control of the mucus and blood in the stools in the later stages.

After the acute symptoms have subsided sterilized milk is allowed in small amounts well diluted with barley or wheat-flour gruel. Later pasteurized milk is permitted with jellied gruels and broths. The prostration may require hypodermatic medication in the form of atropin gr. 1/400 with strychnin sulph. gr. 1/250. As a daily routine, one saline irrigation at 100° F. serves a double purpose, as a cleansing solution and for absorption of part of the water. Strychnin sulphate gr. 1/300 may be given as a tonic three times a day, and astringent enemas for the control of blood and mucus. Silver nitrate 2 per cent. or a starch paste in less severe cases may serve the latter purpose. They should not be given more than once daily, and discontinued if the effect is not satisfactory. Too frequent irrigations often cause irritation and aggravation of the symptoms. Removal to the seaside or cool mountain air is a great help in the management, particularly in the convalescent stage.

Chronic Gastrointestinal Indigestion.

This is a condition resulting from deficient motor and secretory powers in the alimentary tract, or as a result of continued improper food.

Etiology.— Improper feeding, especially in poor children in the cities where the surroundings are unhygienic, is the principal cause of this affection. When the food is radically wrong, or unwholesome, an acute condition develops which makes the parent seek medical treatment; on the other hand, the chronic condition due to incapacity to digest certain ingredients of the food is often overlooked or ascribed to anemia, parasites, etc. An excess of the fats, carbohydrates, and sugars or of the proteins may overtax the intestinal digestion, thereby using up energy which should have produced development and growth.

In older children badly prepared foods or indulgence in rich foods, pastries, and condiments lead to this condition.

Pathology.— There are no definite organic changes found in this disease. If of long standing, the lymph follicles in the region of the ileocecal valve may be hypertrophied or a chronic colitis may be found.

Symptomatology.— As indicated above, the symptoms are not appreciable at first, unless the disease directly follows an acute gastritis or enterocolitis. After some time failure to gain weight is noticed; the child sleeps badly, has frequent attacks of colic, and cannot easily be comforted; the stools become diarrheal for several days, then resume a more normal appearance, only to relapse into a condition of diarrhea or even constipation. Closer examination of the stools shows that they consist of masses of undigested food, intermingled with a small quantity of mucus, while streaks or splashes of green color are not infrequent.

The musculature becomes soft and flabby. If the child has previously sat up or walked, it may now be unable to do so. The abdominal wall offers little or no resistance on palpation and the normal peristalsis is sluggish. The temperature is rarely elevated except late in the disease; on the other hand, a subnormal temperature is not uncommon. Intertrigo in the napkin region is exceedingly common in infants. If corrective measures have not been instituted by this time a marantic condition supervenes which may lead to a fatal issue.

In older children the symptoms are not as marked, but the stationary weight or loss of weight, anemia, and listlessness should recall the possibility of this condition. The appetite is capricious, and as a consequence the children are indulged to a vicious degree by their parents. Attacks of constipation alternate with diarrhea, the urine is somewhat decreased in amount, it may be cloudy, and contains an excess of indican (see Plate I). The children become irritable and moody, having seemingly lost their former characteristics. They become cold easily, develop headaches, and are easily nauseated. The abdomen becomes prominent from gas distention, the stomach itself, if mapped out, shows enlargement, but there is no pain or tenderness on abdominal palpation.

Treatment.— Good hygiene and proper dietetic treatment are absolutely necessary to effect a cure. In the case of the poor, removal to a properly conducted hospital, preferably one near the seashore, will often work wonders.

The diet must be so adapted that it will correct the former faults, but still take into consideration the deficiency of digestive secretion and maldevelopment of the alimentary tract. An analysis of the breast milk or of the last formula given to an infant, studied in connection with its stools, will usually show which ingredient is at fault. A wet-nurse will sometimes quickly produce an amelioration of the symptoms. Detailed instructions as to the room, air, bathing, and exercise must be given if the patient is to remain at home. The roof or piazza can be effectively utilized, and the greater part of the day should be spent out of doors. Before any dietary changes are made it is well to wash out the stomach, and thoroughly irrigate the bowels with saline solution. In some instances the bowel irrigations may have to be repeated once or twice. An initial dose of castor oil, one to two drams and a minim or two of the tincture of nux vomica, three times a day, will usually constitute all the drug treatment that is necessary.

If the infant is artificially fed, the milk can for a time be so modified as to prevent the curdling action of rennet in the stomach by the use of peptonization or the alkalies or the addition of sodium citrate. A formula weaker than the requirements of a normal child of a corresponding age must be temporarily given. Rapid gain in weight must not be expected. Convalescence is slow and protracted.

The management in the case of older children is mainly dietetic. From time to time a diet list of certain permissible articles of food should be given, beginning with such as are easily digested and assimilated, and gradually increasing the number and variety as the improvement warrants (see diet list, p. 160).

Aerotherapy, stimulating baths, and massage are necessary adjuncts to the dietetic treatment. Without constant supervision and attention to the daily routine, meager improvement will be experienced.

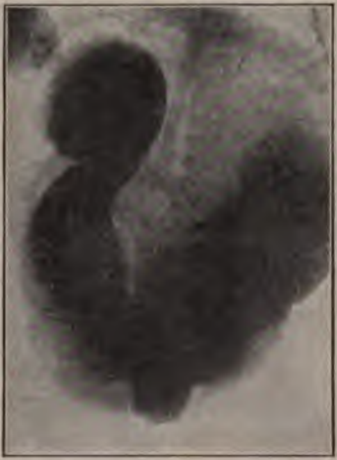


FIG. 56.— Congenital dilatation and hypertrophy of colon. Transverse colon sagging into pelvis.

Congenital Dilatation of the Colon.

(*Hirschsprung's Disease.*)

This is a rare condition which consists of an increase in the length and circumference of the descending colon and the sigmoid flexure. In some cases there is an added hypertrophy of the muscle fibers. As a result of this condition the abdomen is greatly distended from meteorism, feces are more or less retained, the constipation is extremely obstinate, and when the fecal masses are passed, either naturally or by artificial means, they are extremely foul, putrescent, and may be covered with mucus and some blood.

Treatment.— Daily irrigations must be used to produce bowel evacuation. Massage and douching of the abdomen with cold water should be persisted in for a long time. Internally the daily administration of a laxative and drop doses of the tincture of nux vomica before meals are advisable. Since the condition predisposes to the ready putrefaction of food elements, owing to the stasis which results from meager peristaltic action, it is necessary to carefully supervise the diet, feeding only wholesome milk, well-cooked cereals (at least 3 hours), scraped meats, chicken, etc., and stewed fruits. Foods which may contain large quantities of purin bodies are especially to be avoided. If, in spite of the dietetic and mechanical treatment, the condition is not improved, surgical intervention may be considered — some surgeons electing to do plication. An X-ray examination with a bismuth meal will give a good idea of the progress that is being made by treatment.

Cholera Infantum.

Cholera infantum is a very acute disease characterized by rapid prostration, vomiting, and a profuse serous diarrhea.

Etiology.— It occurs almost entirely in the hot months of the year, among the poorer classes who live on inferior milk, and very rarely attacks breast-fed infants. It is the result of a toxic poisoning from an organism or group of organisms still undetermined.

Symptomatology.— The symptoms are out of all proportion to the anatomical lesions which are found at necropsy. A child apparently quite well or only ill from a digestive disturbance suddenly begins to vomit and has a rise of temperature. A profuse diarrhea follows, possessing the characteristics of decomposition with very foul-smelling stools. The stomach and intestinal contents are at first expelled in this manner. The vomiting then consists of a watery fluid with flakes of mucus. The stools also now lose their fecal character, and are watery, greenish-gray in color, with a peculiar old musty odor which is quite characteristic. These discharges at first copious and explosive become smaller in amount but very frequent; they consist of serum and mucus, and may be as many as twenty or thirty a day. In some cases there is an almost constant oozing from the anal ring. The vomiting and diarrhea with the high temperature causes a quick collapse and an emaciation which is extremely rapid, due to the character of the discharge, which is largely blood serum. The extremities are cold, the pulse feeble, the respirations shallow and sighing, and the infant lies in a semicoma. Thirst is extreme, and water is eagerly taken. Meningitic symptoms supervene, with delirium, twitching, purposeless movements or convulsions. Unless the progress of the disease is arrested, the temperature rises to 105° or 107° F., with coma and death resulting from cardiac exhaustion at the end of the second or third day. If the treatment has been successful, the convalescence is extremely slow and demands incessant care.

Course and Prognosis.— This should always be given as extremely bad. If prostration comes on rapidly, with high temperature and nervous symptoms, the course is often not longer than twenty-four hours.

Treatment.— This must be energetic and heroic if any good is to be accomplished. Gastric lavage with warm saline solution should be made if the patient is seen early. If prostration is apparent, stimulation is the first indication, and is here best obtained by the use of hypodermoclysis which supplies the tissues with fluid and likewise stimulates. Inject eight to ten ounces into the subcutaneous tissue of the abdomen — using for this purpose sterile normal saline solution (6 grs. to the liter) and repeat this every four to six hours. Enemas of normal salt solution may also be employed. For a very rapid effect a hypodermatic injection of atropin gr. 1/600 is efficacious, acting also as a check to the serous waste. This may be repeated every three hours if necessary. Camphor in sterile olive oil (one grain of camphor to every ten minims of oil) may be injected in the intervals, if the cardiac action is feeble. Immersion in warm baths at blood heat, or at 110° F. if the temperature should suddenly drop, is efficacious. They should be continued for a half-hour, and repeated at three-hour intervals; gentle friction and the addition of mustard, one tablespoonful to the bath, will assist in keeping the extremities warm. No food is permitted and no medicines should be administered by mouth until the danger of death from collapse is past. Should the child rally, cautious feedings and medication as outlined under the article on Summer Diarrhea, is to be followed under the supervision of a competent nurse. As soon as possible thereafter a change to the seaside should be made.

Constipation.

This should be regarded as a symptom and not a disease, and accordingly the underlying cause should be sought for and corrected.

Etiology. Rare Causes.— The condition may be caused by congenital anatomical abnormalities, by new growths, or by the disproportionate length of the sigmoid flexure. Adhesive peritonitis (especially the tuberculous variety) also causes constipation.

The **commoner causes** are mainly dietetic. Artificially fed infants are the most frequent sufferers because of badly balanced food mixtures (see Artificial Feeding, p. 140), either too large or too small an amount of one ingredient of the milk, or the boiling of the milk itself acting as causes. Breast-fed infants are constipated from deficiency in the fat or total quantity of solids present in the mother's milk. In older children a badly arranged dietary, especially a deficiency in the carbohydrates and fruit juices, will cause this symptom. Next to the diet, the lack of training of the child is an important cause in producing constipation. Children who suffer from constitutional diseases, such as rickets and infantile atrophy, may be constipated because of the lack of expulsive power and deficient peristaltic action.

Other causes are deficiency of the intestinal and biliary secretions, nervous inhibition of the normal peristalsis in such diseases as meningitis, and intestinal parasites. The fear of causing pain when at stool, as from fissures of the anus, may lead to constipation.

Symptomatology. In Infancy.—Colicky pains and flatulence precede the passage of the fecal mass, which is hard and dry or putty-like. Absorption of the toxins may cause rise of temperature or possibly convulsions. These infants are inclined to be fretful with capricious appetites and are poor sleepers. They are likewise inclined to eczema. Rectal examination will reveal the fecal masses.

In Older Children.—The tongue is coated, the breath is foul, and there is lassitude and depression with headache. There may be a slight rise of temperature, and the complexion becomes sallow or pasty. The appetite is lost. Sleep is disturbed. The stools are passed with an effort, may be mucus-coated and exceptionally large and ball-like. The child may go for several days without a movement. Digital examination will clear up any doubtful case.

Treatment.—With persistent and patient effort all cases can be cured. The food taken by the child must be studied and the error which is usually dietetic set right. Medicines should have a minor place; the main reliance should be on diet, correct habits, and massage. Deficiency in the total amount or irregularity of any of the food components must be properly balanced. If the fats are deficient in the mother attempt should be made to improve the milk by dietetic and hygienic measures, and by regulating the amount of sleep and exercise. If this fails, alternate feedings or supplementary feedings of modified milk may be given. Nursing mothers should be placed on a diet list which would include plenty of clean raw milk, cornmeal gruel, and water between meals. Feeble infants in whom the efforts to expel the mass are unsuccessful, as is evidenced by the finger in the rectum, are helped by gentle massage of the abdomen, the introduction of a gluten suppository or the nipple of a rectal syringe. Artificially fed babies are most often constipated because they are usually on a modified food incorrectly ordered. See to it that there is a sufficiency of fat and protein in the mixture and that the curd is mechanically broken up by the addition of a gruel.

Oatmeal gruel may be tried in infants suffering from constipation. Water between the feedings must be offered freely. A tablespoonful or two of orange or pineapple juice is decidedly beneficial in infants after the first six months of life. Beef juice or chicken broth are laxative and may be judiciously employed. If the mixture has been made up with a proprietary infant food, this should be changed. If the constipation has been neglected for some time it may be necessary to use soap enemata, four to eight ounces at a time. Glycerin suppositories at first may be tried in conjunction with a proper diet and hygienic measures, and then gradually use milder procedures as improvement takes place. By simpler procedures is meant the injection of a few drams of olive oil or an ounce of warm water with a baby rectal syringe.

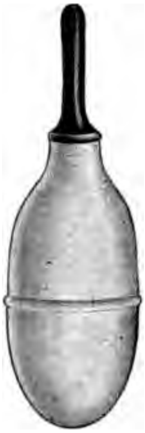


FIG. 57.— Rectal syringe for infants.

The elixir of cascara sagrada (N. F.) ten to thirty drops may be prescribed, or malt and cascara given in the minimum dosage possible to produce a satisfactory movement (one-half to one teaspoonful). As soon as the supplementary measures can be depended upon, the medicines should be abandoned altogether.

A regular stooling habit can be cultivated almost from infancy by placing the baby on a small commode at regular intervals and is a prophylactic measure of importance in child life.

The constipation of older children may be corrected by the addition of cream and butter to the food, or in other instances, a greater amount of vegetables and fruit must be ordered. The giving of food stuffs that leave a large residue in the bowel are of service, such as bran biscuit, shredded wheat biscuit, whole wheat bread, graham crackers, agar-agar (the latter to be mixed in about 1 teaspoonful) with the morning cereal. (See special diets, p. 163.) Taking a glass of water on arising, followed by a cold sponging and abdominal massage will cure many cases if regularly carried out, besides improving the general body tone and blood-supply. Calomel, castor oil or the salts should not be given for this condition. They are cathartic in action and tend to produce constipation.

Amebic Dysentery.

Etiology.— Sporadic cases of amebic dysentery in children have come under our observation with greater frequency in the past few years. The diarrhea is characterized by profuse, watery stools admixed with blood from which the ameba coli can be isolated. It probably occurs much more frequently than is recognized in our Southern States, and because of our colonial possessions it is more apt to gain an entrance into this country. The exact sources of infection are not known but in all probability the intestinal tract is infected by contaminated drinking water or the ingestion of raw vegetables or fruits.

The ameba is a unicellular bit of motile protoplasm having a clear outer zone and an inner granular area with a nucleus and usually some vacuoles are present. Schaudin describes two varieties — Entameba coloid, a nonpathogenic organism, and Entameba hystolytica, a pathogenic organism. Later observers have pointed out that all forms may become pathogenic. The United States government refuses admission to the Hawaiian Islands of any Filipino whose stools contain ameba of any kind.

Examination of Stools.— The specimen is collected on a warm glass slide, from a freshly passed stool. If the stools are not free, a saline laxative may be given. The mucus present or a shred of mucous membrane usually contain the greatest number of ameba. Leischmann's stain may be used.

Pathology.— The lesions consist of ulcerations in the large intestines or the lower part of the ileum. Necrosis of the mucous membrane over these ulcers soon takes place leaving a dirty edematous, submucous layer exposed. The ulcers are generally undermined with rounded infiltrated edges. In aggravated cases the muscular or even the serous coat may be exposed and the ulcers are then found extending through the hepatic flexure into the rectum.

Symptomatology.— An irregular diarrhea in a child which does not abate after the usual course of treatment should excite our suspicions and invite careful examinations of the stools for the presence of the ameba. This is especially true if sudden exacerbations occur after a period of apparent quiescence. The stools are usually very numerous, watery and contain mucus and blood. The blood varies in quantity and is out of proportion to the amount of mucus. During the exacerbations in which the patient will have abdominal pain and tenesmus, the ameba are more likely to be found in the fresh stool. The course of the disease is rather protracted and convalescence is slow, usually complicated by a secondary anemia. We have never observed complicating abscesses of the liver or lungs in any of our cases, although these form most dangerous sequellæ in tropical countries. The ameba are persistently found in the stools even after convalescence is well established and the stools are no longer dysenteric in character.

Treatment. Prophylactic.— Contaminated food and water convey the disease, the latter in turn, being infected probably through the agency of the common fly. For the most part it may be regarded as a water born disease, boiling the water and even the milk is necessary in suspected localities and tropical countries. No raw vegetables should be included in the dietary of children residing in localities where the disease is endemic. The patient should be kept in bed at rest until the stools assume a formed character. This is necessary to prevent exacerbations and complications. The diet should consist of warm gruels or paps made from such articles as arrowroot, cornstarch or farina. It is best to withhold milk until the active symptoms have subsided. Eggs and thickened broths may be cautiously added, and finally whey and milk.

Drug Treatment.— One-half to one ounce of castor oil should be given at the outset. Bichloride of mercury in doses of 1-80 gr. in sol. may be given every two hours, until the stools regain their normal characteristics. The abdominal pain is relieved by hot turpentine stoops, and the tenesmus with thin starch enemata. Warm colonic irrigations of quinine in solution 1 to 1000 are destructive to the ameba. The syrup of the iodide of iron is indicated in convalescence as it counteracts the anemia. Change of climate should be ordered if possible and the attendants instructed to carry out typhoid precautions until the stools are entirely free of the infecting agent.

CHAPTER XIX.

THE ANIMAL PARASITES.

These may be conveniently divided into several groups and sub-groups (see table below). Only those that are found with some frequency in childhood will be described and pictured.

Parasitic Protozoa.

ANIMAL PARASITES FOUND IN CHILDHOOD:

Nematodes.— Oxyuris vermicularis (thread worm). Ascaris lumbricoides (round worm). Trichina spiralis. Ankylostoma americana (hook worm).

Cestodes.— Tenia saginata. Tenia solium (pork tape-worm). Bothriocephalus latus.

Although infection is more frequent with intestinal parasites among children than in adults, the cases are mainly found in the offspring of foreigners in this country.

These parasites are taken to be the cause of many of the ailments of children by parents frequenting the dispensaries and many of them have been given the therapeutic test without any clinical evidence of the parasites being present. When they are present in any quantities they may do harm, especially in sickly children, by impoverishing the albumin content, by acting as foreign bodies in unusual sites, and by poisoning their host through their metabolic products. The evil effect of intestinal parasites is often exaggerated in the mother's mind.

Oxyuris Vermicularis.

(Thread Worms.)

These are small white filament-like worms usually found in the rectum. The female is larger than the male, and usually is found in the cecum, until impregnated, when it descends to the rectum.

The eggs are oval, asymmetrical, about 0.05 mm. in size. Their interior is filled with a granular yolk, containing a clear nucleus. The oxyuris differs from some of the other parasites in that it does not require an intermediary host. The worms and the eggs pass out of the rectum alone or with the feces, and may directly inoculate a human body. The child may reinfect itself by handling toys, or food, and may infect its playmates. The ova are carried in drinking water or by flies to vegetables and fruits.

Symptomatology.— The worms by their presence may produce irritation of the anus, or if present in sufficient numbers, even a colitis or proctitis may result. The children sleep poorly and scratch about the anus. They lose their appetites, become irritable, and even anemic. In girls, particularly, the parasites may invade the genitals, and result in masturbation or incontinence of urine. Sometimes no symptoms are to be noted.

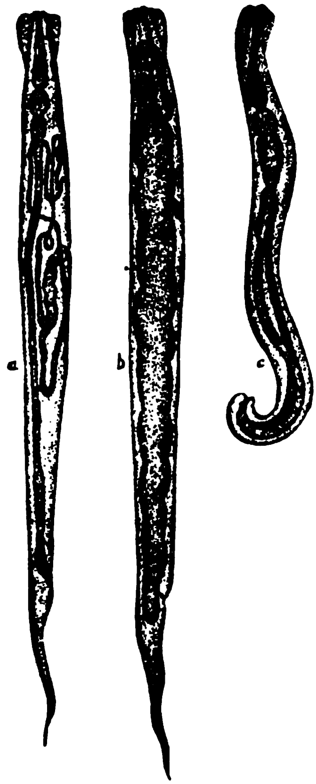


FIG. 58.— Oxyuris vermicularis; *a*, sexually mature female; *b*, female with eggs; *c*, male. (*After Heller.*)

Diagnosis.—An enema of cold water will disclose any parasites present if they are not found in the stools or at the anus. The eggs are found with difficulty in the stools; more often they are found under the finger-nails of the infected child.

Treatment. Prophylactic. By attention to the person of the patient, self-inoculation can and must be prevented. Baths, clean finger-nails, restrictive apparatus for the hands or heavy canvas drawers to prevent scratching are sometimes necessary. Examine other susceptible members of the family to prevent reinfection.

Internal.—A grain of calomel or a teaspoonful of Rochelle salts in water is given to bring down the females from the cecum.

Locally.—Daily enemata of saline solution may be given followed three times a week by injections of the infusion of quassia, this to be retained for a time if possible. Further, a 2 per cent. yellow oxid of mercury ointment is applied about and into the rectum at night. This treatment should be persisted in until the bowel is thoroughly rid of the worms, and renewed if any are seen at a later date.

Ascaris Lumbricoides.

(*Round Worm.*)

This parasite is round with a smooth body from four to six inches long and pointed at each end. The mouth has three suckers and teeth.

The female is very prolific, producing millions of eggs. These are rounded or oval in shape (see Fig. 59). It has been proven by experimentation that no intermediary host is necessary. Although they normally inhabit the small intestine, they move from place to place. They have been frequently vomited from the stomach and have been found in the gall bladder and appendix in children. Through its ova it gains entrance to the human intestinal canal. Round worms are spread by water and uncooked vegetables through deposited ova.

Symptomatology.—The parents themselves often make the diagnosis of round worms when they have seen them passed. When questioned the majority of the patients do not give any symptoms directly referable to the worms, and many have had no symptoms whatever. The symptoms usually present are loss of appetite, nausea, or diarrhea, occasionally there are pains referable to the abdomen, which are soon forgotten, only to reappear again. Pruritus ani, pavor nocturnus, choreiform movements, and convulsions have been observed. A rather constant eosinophilia is present in patients with round worms, and this should be a stimulus to examine the feces for ova. By their local action of migration they may produce obstruction of the intestine or even a fatal issue, as in laryngeal obstruction.

Diagnosis.—The microscopic examination for the ova is readily made and should not be omitted in questionable cases having an eosinophilia.

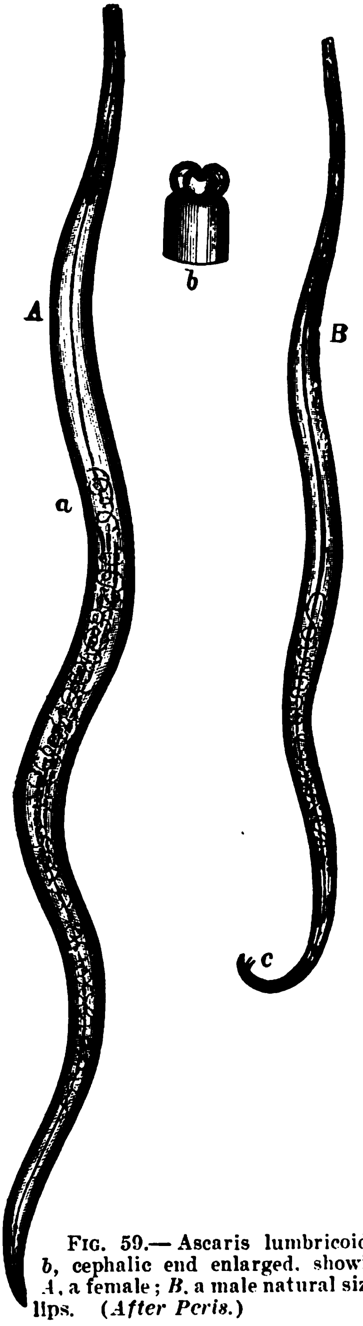


Fig. 59.— Ascaris lumbricoides.
b, cephalic end enlarged, showing
A, a female; B, a male natural size;
lips. (*After Peris.*)

Treatment. Prophylactic.— Cleanliness of body, a pure water-supply, and avoidance of unboiled vegetables for children decrease the possibility of infection. Care in the handling of the stools of children will also prevent infection of others.

Internal.— Calomel and santonin is a dependable combination for this parasite. A half-grain of each drug with sugar of milk is usually sufficient. Never give more than a grain of santonin, as poisoning may be produced. It is best given with some food and in divided doses. The stools should be examined for ova each week for three weeks, as until then there is no positive certainty of their absence.

Cestodes, or Tape-worms.

General Characteristics.— The tape-worms commonly met with in this country in children are the Tenia mediocanellata (or saginata) or beef tape-worm, and the Tenia solium or the pork tape-worm. They are flat, ribbon-like, jointed parasites, yellowish in color, and vary in length from ten to twenty feet, the segments growing smaller until the head is reached. It is only in the intestinal tract of man that the fully developed parasite is found. The ova are taken into the alimentary tract of an animal and their covering is dissolved and they then pass through into the muscles of the animal and become encysted there. Such meat is commonly spoken of as being "measly." This infected meat when eaten by man allows the larvæ to develop into the tape-worm. Although occurring rarely, man may himself act as the intermediary host and cysticerci develop in his organs.

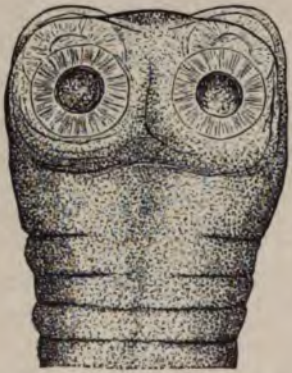


FIG. 60.— Head of Tenia saginata, much magnified.

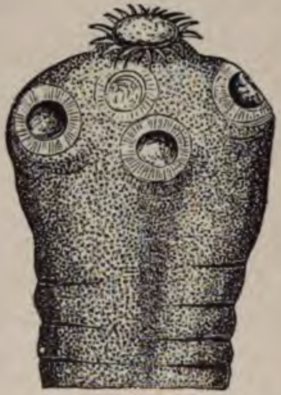


FIG. 61.— Head of Tenia solium, showing scolex, suckers, hooks, and neck.

Tenia Mediocanellata or Saginata (*The Beef Tape-worm*).

These worms may be distinguished by the appearance of their heads under the magnifying glass. The head of the beef worm is cuboid, slightly darker than the rest of the body and it has no hooks as the pork worm has; instead four suckers are seen on the head. Its eggs are smaller than that of the Tenia solium, and contain hooklets.

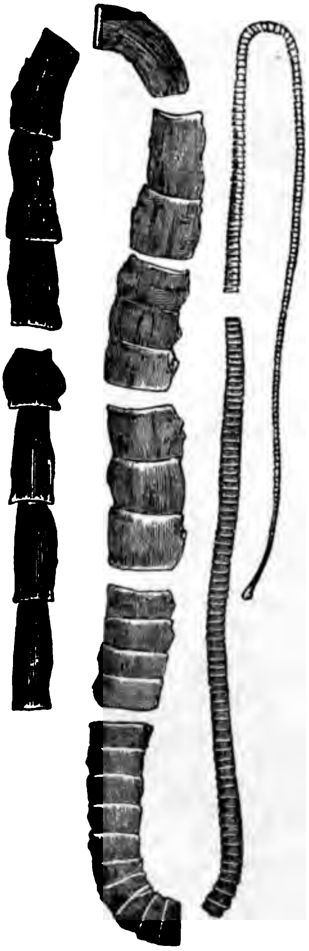


FIG. 62.— Portions of a Tenia Saginata. (*After Leuckart,* natural size.)

Tenia Solium (*The Pork Tape-worm or the Armed Tape-worm*).

The head of this parasite which is about the size of a pin-head, has besides the four suckers found on the beef-worm, a set of hooklets. They often reach nine feet in length. The eggs are round and contain the embryo with its hooklets.

Symptomatology.—In the great majority of cases there are no pathognomonic symptoms referable to the teniæ. Often it is only when the segments are passed that their presence is indicated. Older children may complain of grumbling, griping pains, and have symptoms of indigestion. They become anemic, have headaches, and complain of dizziness. Sometimes a capricious or voracious appetite may excite suspicion, if coupled with a history of eating raw beef or pork.

Treatment. Prophylactic.— Proper meat inspection at the abbatoir. A dissemination of the harm that may be caused by eating of raw or badly cooked meats and destruction by fire of all segments passed would materially reduce the number of these cases. The children of foreigners are especially to be warned.

Internal.— The parasites can be removed if a systematic cure is outlined and rigidly followed, as the head is firmly attached and must be dislodged to effect a cure. First day: a dose of castor oil, at least a half ounce, is given, followed by fasting for the remainder of the day. Second day: following a cup of clear consomme or weak tea, give the following prescription for a five-year-old child, while the child is kept in bed.

℞

Oleoresinæ aspidii	ʒj
Mucilaginis acaciæ	ʒij
Spiriti chloroformi	♏x
Aquæ cinnamomi q.s. ad.	℥j

Misce et Sig.—One-half the quantity at a dose.

The remainder is given after a few hours, if the child should vomit the first dose; they rarely reject the second, if kept prone in bed.

Several hours after the vermifuge has been given, a glass of the effervescent citrate of magnesia is taken. The worm should be passed into a clean vessel, containing warm water, and careful examination made for the head, for unless this is identified, the cure will be unsuccessful.

This treatment has been so successful in our hands, that there has been no necessity to resort to less reliable vermifuges, as the pelleterine tannate, kousso, kamala, etc.

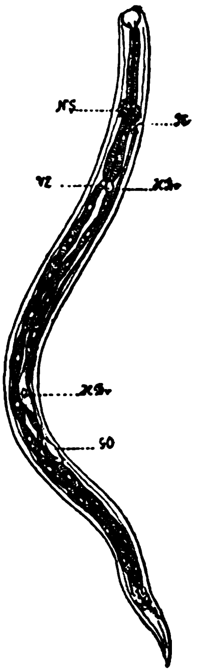


FIG. 63.—Uncinaria duodenalis. (*After Loss*, × 105.)

Hymen-O-Lepis-Nana.

(*Dwarf Tape-worm.*)

The habitat of this tape-worm is in the upper two-thirds of ileum. It presents no special symptoms. Its average length is 14 to 16 mm. The segments are three to six times as broad as long. The head is globular and carries four segments.

Uncinaria Duodenalis.

(*Ankylostomum Duodenale or Hook Worm.*)

This parasite has assumed a greater interest for us in the past few years because of our new possessions in the West Indies, and since the publication of the investigations of Stiles who has shown how prevalent they are in the children of the Southern States.

The hook worms are small thread-like parasites with four teeth which enable it to attach itself to the intestine, the jejunum being its favorite site. The eggs develop rapidly and the embryos are very tenacious of life. The eggs are oval in shape, with a distinct capsule and a brownish content.

Unclean water, the eating of raw vegetables, and unclean hands and bare feet are the means through which infection takes place.

Symptomatology.— The children having hook worms are pasty, white and thin. The appetite is abnormal; mainly a craving for the unusual. The anemia is marked, so that the patient is listless, without ambition, and mentally dull. Later the abdomen becomes prominent and there is edema of the extremities. The stools if examined show the ova.

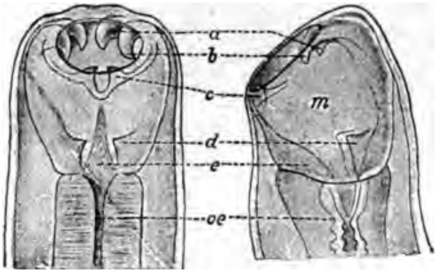


FIG. 64.— Oral capsule of Uncinaria duodenalis.

Treatment.— Thymol is almost a specific for the hook worm. The bowels should be emptied with calomel or castor oil, the diet restricted, and thymol given in five-grain doses every two to three hours until twenty grains of the solid drug are taken. Another purge should now be administered or a high enema given. Weekly examinations of the stools should be made, and if any are found, repeat the cure each week. Following the elimination of the ova, an iron peptonate should be prescribed until the hemoglobin content is normal.

Trichina Spiralis.

Children are liable to infection from this parasite by eating diseased pork. Those living in country districts where the curing of the pork is done at the farmer's home are especially liable. The encapsulated trichinæ are freed in the stomach, propagate and deposit living embryos. Those which are not passed out of the intestinal canal, reach the muscles where they develop and finally become encapsulated.

Symptomatology.— During the first week of their ingestion the symptoms are slight and those of a gastrointestinal nature. Then general muscular pains with high fever develop and are often mistaken for rheumatism or typhoid. Transitory swellings appear. The muscles are painful to the touch; nausea and vomiting or diarrhea may be present. Dysphagia prohibits the taking of nourishment. Stupor and coma may ensue in fatal cases. Eosinophilia is marked and is a distinct aid to the diagnosis.

Treatment. Prophylactic.— Reliable meat inspection and thorough cooking of all hog meat (200° F. are necessary to kill encapsulated trichinæ) are measures

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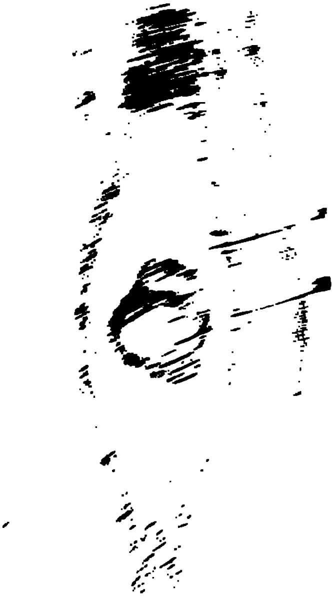
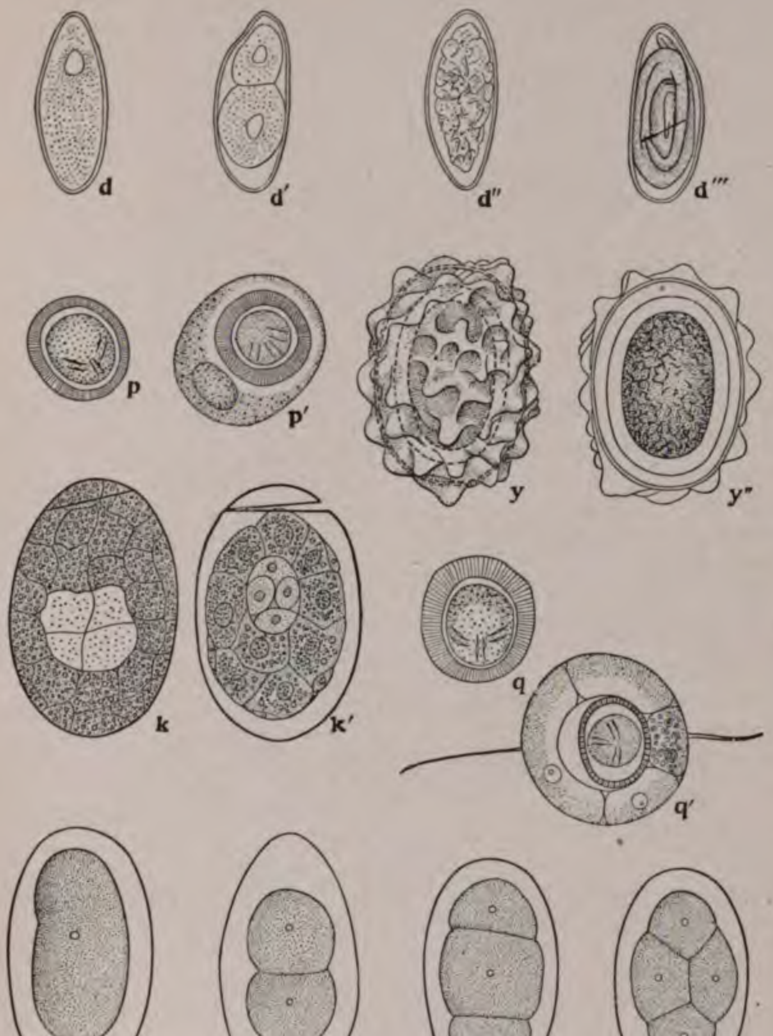


PLATE V.



Ova of the cestodes of early life. Tenia solium (Pork tape-worm), p-p′; Tenia saginata (Beef tape-worm), q-q′; Bothriocephalus latus (Fish tape-worm), k-k′; Uncinaria americana (Hook-worm), x-x′-x″-x‴; Ascaris lumbricoides (Round-worm), y-y″; Oxyuris vermicularis (Thread-worm), d-d′-d″-d‴.

CHAPTER XX.

DISEASES OF THE LIVER.

The Liver.

The liver is of relatively large size and functional importance in early life. In fetal life it is a very important factor in the circulatory system, while the lungs are largely inactive. Thus in the mature fetus the liver holds a quarter or more of the entire volume of blood, and it is greater in size than both lungs. As the lungs of the fetus are solid, and almost impervious, the placenta of the mother performs the double function of a respiratory and of a nutritive organ. After the venous blood is received from the fetus it must be returned reoxygenated, and nearly the whole of this purified stream is carried to the liver by the umbilical vein and circulates through this organ before reaching the vena cava and the general circulation. The large size and importance of the liver in fetal life are thus understood by considering it a sort of intermediary organ between the placenta and the general circulation, as far as the reoxygenated blood is concerned. At birth the lungs should at once inflate and assume the respiratory function. The umbilical vein is completely obliterated in a few days and finally becomes the round ligament of the liver and the ductus venosus is likewise obliterated. Although the liver now loses its preponderating importance in the economy, it still remains relatively larger and heavier than in later life. The diminution of the organ is due to its altered blood supply, and is especially marked in the left lobe. . The loss of weight that begins at birth continues, so that there is a direct ratio from infancy to old age in this relative diminution. In infancy the liver weight is in proportion to the whole body as one to twenty; at puberty, one to thirty; in adult life, one to thirty-five; in middle life, one to forty; in old age, one to forty-five.

Examination of the Liver.

The child is placed in the recumbent position with the thighs flexed in order to relax the abdominal muscles as much as possible. The organ may then be mapped out by palpation and percussion. The liver projects from ½ inch to 1 inch below the free borders of the ribs. In the median line the lower border of the left lobe extends to within about an inch of the umbilicus. It must be borne in mind that the liver ascends and descends with full inspiration and expiration. If the organ is enlarged it can be detected by deep palpation and effort should be made to map out the seat and character of the swelling.

On percussion, liver dullness along the upper border will begin at the right sternal margin and in the mammary line in the fifth intercostal space, in the axillary line at the seventh rib, and in the scapular region at the ninth rib. Upon very light percussion, the dullness will be noted a little below these lines.

Apparent enlargement of the liver may be caused by a slight displacement induced by the bony deformity of the thorax in rickets, by effusion in the right pleural cavity, by tumor of the right kidney, by fluid in the abdominal cavity, or by subphrenic abscess. The commonest causes of true enlargement of the liver in early life are abscess, fatty degeneration, cirrhosis, and leukemia.

Jaundice.

Icterus neonatorum has been considered in the section on Diseases of the Newly-born. In attacking infants some time after birth jaundice is due to causes similar to those found in children and adults. Owing to some obstruction in the biliary canals, the bile instead of passing into the intestine, is absorbed into the blood.

An inflammation of the duodenum, accompanied by swelling of the mucous membrane at the opening of the ductus communis choledochus, may be responsible for this obstruction. The inflammation may also extend by direct continuity from the duodenum to the ductus communis and hepatic ducts, and thus cause retention of bile in the liver.

A plug of inspissated bile in the common duct, and, more rarely, gallstones may also cause obstruction. Complete stoppage has been reported by a round worm penetrating the common duct from the duodenum.

Inflammatory changes in the liver, as in cirrhosis, may induce jaundice by obstruction from pressure in the intrahepatic ducts. Finally, certain toxic conditions, as in paludism and various infectious diseases, and rarely phosphorus poisoning may act as causes.

Symptomatology.—The most objective sign is the general yellowness of the skin and the conjunctivæ. Other abnormal tints of the skin simulating jaundice may be differentiated by the yellow conjunctivæ and by the presence of biliary pigment in the urine.

Itching of the skin may be present. Urticaria, which is so common in children, sometimes ensues when the papules and wheals will present a deep-yellow tint. The yellowness of the skin is usually only to be noted in a natural light.

The most marked internal symptoms may be those that can be referred to a duodenitis or a gastroduodenitis. In the latter case there is more or less nausea and vomiting, with pain in the epigastrium, especially upon the ingestion of food and tenderness upon pressure in this region.

There may be a subacute duodenitis without gastritis being present, when pain will be noted some hours after taking food as it passes from the stomach into the duodenum. The stools may be clay colored from an excess of undigested fat when no bile reaches the intestine. When the obstruction to the passage of bile is only partial the stools may retain a natural browish-yellow color. The complete absence of bile will be shown by a quick decomposition of the intestinal contents as exhibited in the free formation of gases and a foul odor of the feces.

The pulse may be slow as the biliary salts have a sedative effect on the circulation. Most cases of jaundice in young children disappear in a few weeks without leaving any serious consequences, but rarely there may suddenly ensue evidences of blood-poisoning, followed by death. Occasionally the jaundice will last for months without giving rise to much apparent disturbance except a slight stupidity.

Treatment.— Where there is no evidence of gastroduodenal inflammation, active peristaltic action in the duodenum to be transmitted to the bile ducts may be induced by calomel, rhubarb, or colocynth. This may be followed by a mixture containing tincture nucis vomicæ with bicarbonate of potassium or sodium, as alkalies are supposed to have a liquifying effect upon the bile, thus freeing the ducts when they are occluded by a thickening of this secretion.

Only bland and easily-digested food must be allowed. All fatty foods must be restricted and the patient kept on lean meat and plain vegetable food.

When the jaundice depends on a subacute inflammation of the stomach and duodenum, the saline laxatives and mineral waters do well. Carlsbad, Vichy, and Congress waters usually are beneficial. Persistent constipation is one of the commonest symptoms, and must always be relieved.

Inflammation of the Biliary Ducts.

An ordinary acute inflammation of the biliary ducts usually undergoes resolution in a few weeks without any bad results being left behind. As a result of the inflammation a collection of mucus, often taking the form of a firm plug, is located at the opening of the common duct into the duodenum, thus causing more or less complete obstruction.

In chronic cases there may result a thickening of the ducts, with dilation in places caused by the obstructed secretions. Rarely, ulceration may take place in the walls of the ducts. The mucous membrane of the gall-bladder may likewise be the seat of inflammatory changes.

Symptomatology.— Various digestive disturbances shown by coated tongue, nausea or vomiting, and other symptoms pointing to a mild inflammation of the stomach are present at the start. There may be slight fever.

In a few days the conjunctivæ become yellow, the urine is colored by biliary pigment, and the feces assume a clay-like appearance. There may be a slight enlargement of the liver and the gall-bladder may be palpated. There may be some tenderness on pressure over the right hypochondrium. When the inflammation of the ducts is secondary to congestion of the liver, there is less digestive disturbance and milder jaundice of shorter duration.

The treatment is the same as that of jaundice. Where the inflammation is induced by changes in the parenchyma of the liver or by certain infectious diseases, treatment must be aimed at the underlying cause.

Inflammation of the Portal Vein.

Suppurative pylephlebitis may occur as a secondary lesion resulting from suppuration in some of the organs drained by the portal vein or its radicals. Ulcerations of the gastrointestinal mucous membrane, inflammation or ulceration of the biliary duct and umbilical phlebitis in new-born infants whose mothers are septic may spread to the portal system and set up inflammation there.

Symptomatology.— Local pain in that part of the portal vein involved will follow the symptoms of the primary morbid condition. Enlargement and tenderness of the liver may be due to a general hepatitis or to abscesses. The spleen may likewise become enlarged and tender from occlusion of the splenic vein. As pus forms in the portal vein, there will be chills, fever, sweating, and general emaciation. Intestinal indigestion with bilious stools and jaundice usually are present. Although there may be remissions, the disease usually ends fatally in a few weeks.

Treatment.— All that can be done is to treat symptoms as they arise and sustain the strength as much as possible.

Organic diseases of the liver are rare in early life and do not differ essentially from adult life.

Congestion of the Liver.

This condition may be active or secondary. The active form occurs during certain infectious diseases, especially paludism, and in the early stages of abscess of the liver. The secondary form is seen in affections of the heart and any other physical condition which causes stagnation in the liver by checking the access of blood to the ascending vena cava.

The organ is enlarged in both forms, but more so in the cases of passive hyperemia. There is usually tenderness on pressure over the region of the liver.

The treatment must be addressed to the disease or local condition that causes the congestion. Phosphate of sodium, citrate of magnesium, and other saline purgatives may be given to try and deplete the portal circulation.

Fatty Liver.

This condition may be present in various constitutional diseases, especially rickets and tuberculosis. It is more often secondary to the latter disease than to any other. Chronic intestinal disorders and blood dyscrasias may also act as causes.

The organ is generally uniformly enlarged. In some cases the increase in size is very great, but tenderness is absent. There are usually no symptoms, and treatment of the original disease is all that can be accomplished. If there is little enlargement, the condition cannot be recognized during life, but it is seen to some extent in a large number of the autopsies made on young children.

Amyloid Liver.

Waxy liver is secondary to prolonged suppuration in any organ, to chronic joint or bone disease, to tuberculosis or syphilis. The liver is generally enlarged, with a hard, rounded border and [illegible] on pressure. On section, it gives a reddish-brown reaction with iodin. Similar changes also usually develop in the spleen and kidneys, and the spleen is thus enlarged. There are no distinctive liver symptoms or jaundice. Albuminuria may be present from the kidney affection, and ascites or edema from pressure. Gastrointestinal irritation, shown by vomiting and the passage of foul-smelling stools, is often noted. When waxy liver is recognized, it means some form of chronic disease and a grave prognosis.

The treatment consists in trying to check the original focus of suppuration, in supporting the patient, and in handling various symptoms as they arise.

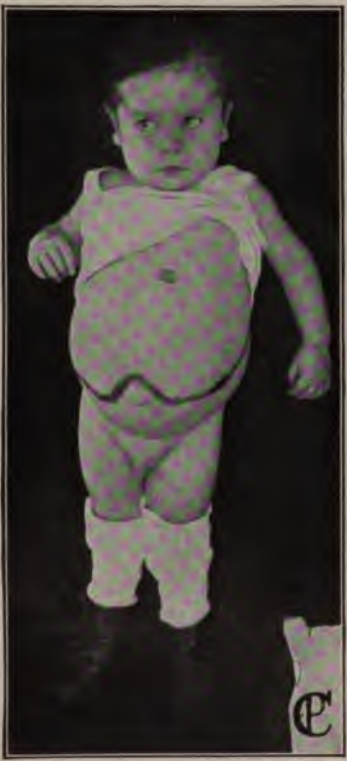


FIG. 66.—Cirrhosis, hypertrophic due to alcohol given from the time of weaning.

Cirrhosis of the Liver.

This disease is rare in early life and is oftener accompanied by enlargement than contraction of the liver. The commonest primary causes are syphilis, alcohol, and chronic paludism. Syphilitic cirrhosis is seen in early infancy, and is perhaps the commonest form of organic disease of the liver at this time. When alcohol acts as a cause, it is in older children of from ten to fifteen years of age. In chronic malarial poisoning, there is great enlargement of the liver when this organ is the seat of cirrhosis. There may be secondary cirrhosis, as in adults, from hepatic hyperemia due to chronic cardiac disease, from prolonged obstruction of the bile ducts, and possibly from infectious diseases, such as measles and scarlatina.

The pathology and symptoms do not differ from cirrhosis seen in later life. It is often difficult to recognize the disease apart from the general condition, such as syphilis, that produces it. There may be no symptoms directly referable to the liver. Icterus may or may not be present, but enlarged spleen and ascites are common.

The treatment must be directed to the primary disease and various symptoms as they arise.

Abscess of the Liver.

Abscess may follow suppuration within the abdomen, very rarely from the migration of round worms through the common duct, from infectious diseases, and in the newly-born from sepsis. It is very rare, however, and the symptoms are similar to those seen in the adult. The treatment is surgical.

Acute yellow atrophy and gall-stones occur with very great rarity in early life, and do not differ in course and symptoms from the same affections in the adult.

SECTION VI.

THE INFECTIOUS DISEASES.

CHAPTER XXI.

THE EXANTHEMATA.

The exanthemata consist of five diseases: scarlet fever, measles, German measles, small-pox and chicken-pox. All except small-pox are distinctively diseases of childhood; although any of them may occur in adults. Each runs a definite self-limited course, subject to variations and complications. As a rule, each renders an individual immune to future attacks of the same disease, but one does not confer immunity from another. Two of them may occur in the same individual at the same time. Each is divided into four stages: the stage of incubation, prodromal stage, efflorescence, and desquamation.

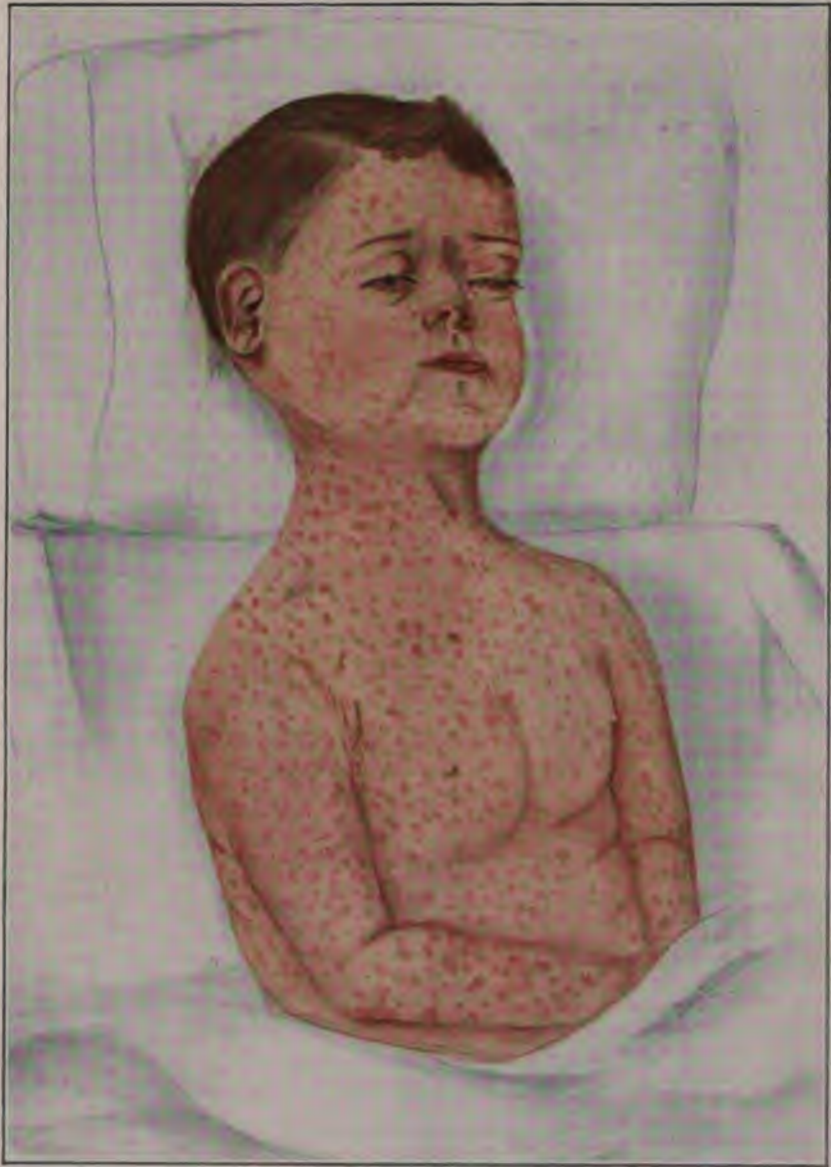
The stage of incubation comprises the interval from the time when the contagium is taken into the system until the first symptoms appear. The prodromal stage is the period included between the appearance of the first symptoms and the appearance of the eruption. The stage of efflorescence extends from the time of the first appearance of the eruption until it fades and the stage of desquamation begins. As the great majority of cases run a typical course, such a form of the disease will first be described, always bearing in mind that the many variations and complications which are later described may alter the general picture.

Measles.

(*Rubeola, Morbilli.*)

Definition.— Measles is an acute contagious disease characterized by a period of incubation, a prodromal stage with fever, coryza, lacrimation, cough, and Koplik's spots, followed by a red, papular eruption and a fine desquamation.

Etiology.— No specific microorganism has as yet been discovered. The contagium is contained in the nasal, lacrimal, and bronchial secretions. It has been transmitted through direct inoculation of the nasal secretions and blood. It is, therefore, more contagious in the early stage. The contagion may extend through the eruptive and desquamative stages. It has



Measles, showing typical eruption.

not the property of clinging tenaciously to such objects as clothing, and it is doubtful if it is often carried by a third person; surely not as easily as scarlet fever. Epidemics spread rapidly, owing to its transmission on short exposure and to its highly contagious character before the diagnostic eruption appears. Most people have the disease at some time during life; therefore, adults are not immune unless they have already had it. It is most frequent between the first and sixth years; rare before the fifth month, and only 5 per cent. of the cases occur under one year. We have, however, seen it at birth. One attack usually protects the individual from further attacks, but recurrences are more common than in any of the other exanthemata. It occurs in all countries and at all seasons.

Pathology.— The skin shows an infiltration of round cells which surrounds the sweat and sebacious glands as well as the capillary blood-vessels which are found distended with blood. The mucous membranes show inflammatory changes. Other pathological conditions, such as bronchopneumonia, are not typical of measles.

Incubation.— Eight to twelve days; usually ten days.

Prodromal Stage.— Three to five days; generally four days. The onset is not usually as abrupt as in scarlet fever. The child appears to have a cold in the head, has some cough, and a temperature of 100° F. to 104° F., according to the severity of the disease. There is not apt to be vomiting, nor are convulsions common, although either may occur. The coryza gradually increases, lacrimation and the nasal discharge become more profuse, the child grows sicker, and finally the face assumes the puffy appearance with redness about the nose and eyes commonly seen in a severe coryza. Very often a deceptive fall in temperature, with seeming improvement of the child's general condition, takes place on the second day, only to be followed the next day by a further rise of temperature and increased symptoms, which continue to increase until the eruption is at its height. There may be in some cases a regular remittent fever during the three or four days of the invasion. Koplik's spots, which are pathognomonic of measles, and almost invariably present, are found on the mucous membrane of the cheeks and lips all through the prodromal stage if inspected in strong sunlight. The first day there are usually less than six of these rose-red spots scattered over the pink mucous membrane, in the centre of which are bluish-white specks. Some are minute, about one-eighth of an inch in diameter. Soon they may increase in number until they coalesce and lose their characteristic appearance as the exanthem comes to its height. Koplik's spots are to be differentiated from the rose-colored papules with superimposed whitish vesicles seen on the soft and hard palate in German measles, scarlet fever, and simple angina, as well as in measles. A redness of the fauces and pharynx somewhat corresponding to the characteristic eruption on the skin may be seen.

Eruption.— On the third or fourth day the exanthem appears on the face in the form of discrete, raised, red, pin-head-sized papules. They are sometimes arranged in crescents. The eruption spreads to the neck, chest, back, and arms, and within thirty-six hours the whole body, including the palms and soles, is involved. While spreading thus, the papules on the face are enlarging peripherically until they become confluent and large areas are covered, with only here and there small areas of intervening normal skin. This process takes place also on the rest of the body in the order in which the eruption originally appeared. The whole face is swollen and has a characteristic mottled appearance when the eruption is at its height. The lids are red and edematous, and the conjunctiva inflamed, tending to keep the eyes half-closed. Photophobia is pronounced. This condition is usually reached within thirty-six hours after the first appearance of the eruption, and continues together with the maximum temperature, coryza and cough, for one or two days. During the next two days the eruption fades and the temperature falls, so that within seven or eight days from the onset of the first symptoms the temperature is normal and desquamation is taking place.

Desquamation begins in the order in which the eruption appeared, often beginning on the face as the exanthem has reached its height on the limbs. It consists of fine flakes unlike the large lamellæ of scarlet fever. It is completed in one or two weeks.

Variations, Complications and Sequellæ.— The incubation may last as long as twenty-one days. There may be no symptoms of rhinitis or bronchitis whatever, throughout its course. Relapses, *i.e.*, recurrences of temperature and eruption, are very rare, but may occur a few days after the temperature has become normal.

Fever.— There are afebrile cases and cases with hyperpyrexia, but neither are common in uncomplicated measles. The remission of temperature on the second day of the prodromal stage may not occur, but the majority of cases show it. A continued temperature after the eruption subsides, or a persistent rise of temperature during the first or second week of convalescence always leads us to suspect complications, particularly bronchopneumonia or middle-ear infection.

Exanthem.— Occasionally the eruption itself is so atypical that a diagnosis can only be made by a general consideration of the other features of the case. Rarely it may be erythematous or even vesicular in character, or the papules may be very large or macular from the first. They may vary from the typical red color to purple or, on the other hand, they may be very faint pink. There may be minute hemorrhagic spots about the papules even in benign cases; or in the severe toxic and often quickly fatal cases the hemorrhagic areas are extensive and simultaneous hematuria and epistaxis occur. In weakly children the eruption is often very limited even in severe cases. It may vary in the order of its appearance, coming simultaneously upon the face and thorax, or even on the thorax or abdomen first. It may subside entirely in twenty-four hours. Entire absence of the eruption is very rare, if it occurs at all.

Lungs.— Here we find the most common and the most dreaded complications of measles. A mild bronchitis with coarse mucous râles throughout the chest is very common during the early stage, and may pass off with the eruption. But often this outcome is not so fortunate, for it may continue into a chronic bronchitis; or while the disease is at its height the respirations may become more rapid, localized areas of fine crepitant râles appear, and bronchopneumonia may develop. Its course differs in no way from the ordinary bronchopneumonia, being the cause of death in the great majority of fatal cases. It may occur at any time between the beginning of the prodromal stage and the completion of desquamation. Lobar pneumonia is seen less frequently. The above-mentioned conditions of the respiratory tract make good soil for the growth of the tubercle bacillus, so that measles is one of the most frequent sources of pulmonary tuberculosis in childhood. Continued involvement of pneumonic areas with persistent cough, temperature and bronchitis should receive prompt attention, and the physician should have this complication constantly in mind.

Pertussis is a very serious complication. Pleurisy and empyema are less common complications.

Nose, Pharynx, and Larynx.— The inflammatory conditions here may cause enough obstruction to lead to much difficulty in feeding or in breathing.

Spasmodic croup, a pseudomembrane of streptococcic origin or a double infection with the diphtheria bacillus may complicate the case. Diphtheritic croup complicating measles is very fatal, owing to the rapid descent of the pseudomembrane into the bronchial tubes. Ulceration of the larynx may cause great edema with extreme dyspnea or subsequently the scar may cause a serious stenosis of the larynx.

Ear.— The external auditory canal may be painfully swollen through extension from the skin. Otitis media is often of a mild grade when due to infection through the blood, but severe cases are due to extension through the Eustachian tube. Mastoid disease has its usual relation to the otitis media, and is a fairly common complication in the purulent otitis cases.

EYE.— Conjunctivitis is of the usual type in a more or less severe form. Keratitis and iritis may result and do permanent damage to the eye. Any previous condition may be rendered more active.

OTHER ORGANS.— The intestines are occasionally involved, and the resulting diarrhea is often severe. Stomatitis may occur from the same source. Cerebrospinal meningitis is occasionally seen, particularly in the pneumonic cases. The heart and kidneys are rarely affected in uncomplicated measles, although the kidneys may show transient abnormalities through the urine. Osteomyelitis and suppuration of the joints have been seen, but are rare.

Prognosis.— The mortality from measles itself is not high, but the pulmonary complications render it one of the most serious of children's diseases. Fatal cases almost invariably show bronchopneumonia or less frequently lobar pneumonia. The mortality averages 8 to 10 per cent., and is greatest during the first year. Epidemics in institutions often give a high mortality.

Prophylaxis.— Measles is by no means a mild disease. Through its complications it is productive of many deaths. All possible precautions should be taken against exposure, especially of those under three years of age. Isolation should be carried out just as soon as the disease is suspected and should last at least three weeks. Children who have been exposed should be kept segregated from other children for that period.

Treatment.— Hygienic and hydrotherapeutic measures are of greater importance than the medicinal treatment. Select a well-ventilated room that is as far as possible from direct communication with the rest of the house. The light should be thoroughly subdued with dark shades or eye screens until all photophobia is past. If the fever is high and causing ill effects, such as delirium, it can be controlled by sponging with luke warm water and by frequent drinks of cool water. If a sedative seems necessary, small doses of phenacetin will have the desired effect (one grain for a two-year-old child every two hours for four doses). The cough in the early days of the eruption is often troublesome and prevents sleep. Small doses of the bromid of sodium with chloral or codein may be given for its control. (Four grs. bromid with one gr, chloral every four hours for a
child of five years or codein of a grain for one or two doses.)
Ammonium chlorid ly tend to produce an
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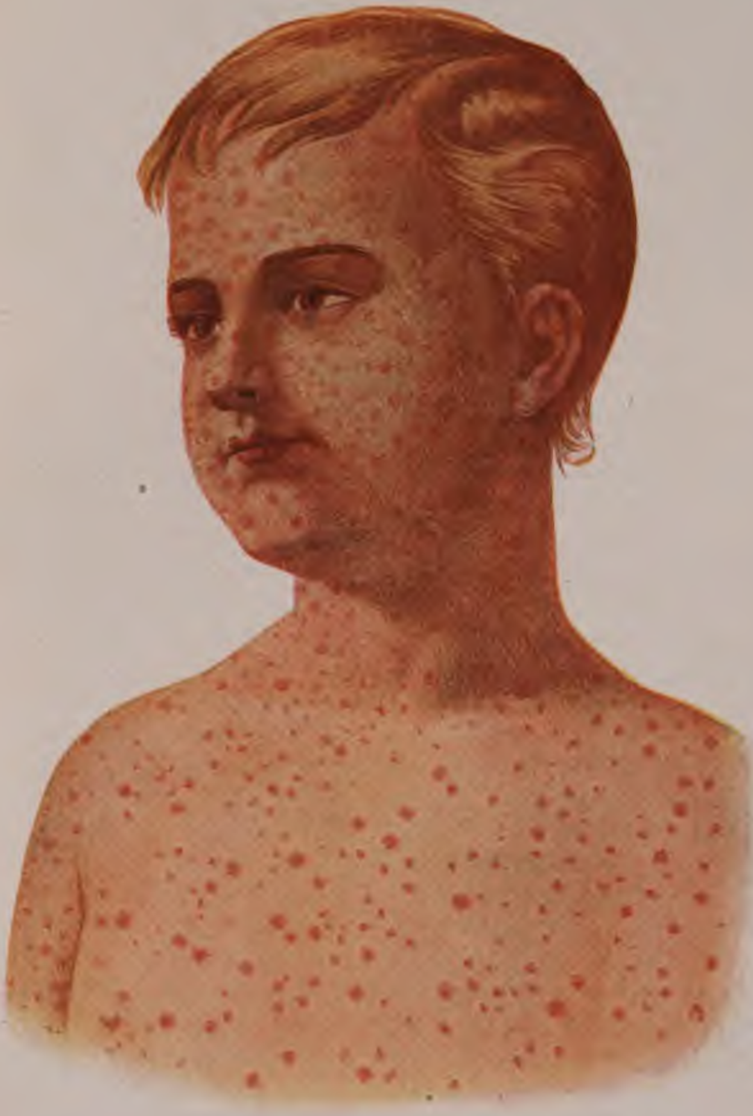


Rubella (German measles).

of the skin, and this may be relieved by inunctions of 5 per cent. ichthyol and lanolin, or 2 per cent. carbolic ointment. The bowels are kept open preferably with small doses of calomel or enemata. The ears should receive careful daily inspection for any redness or bulging, and if present incision and drainage of the ear drum may be indicated. By careful attention to the eyes, ears, and nasopharyngeal toilet, many of the disastrous complications of measles may be avoided. Bronchopneumonia, as a rule, supervenes more often in those cases that have been treated by sweating and administration of hot drinks, thus further lowering the resistance of the child. The diet should be light until the temperature has been normal for several days.

German Measles.

(*Rötheln, Rubeola.*)

Definition.— German measles is a mild acute contagious disease, having a period of incubation, a prodromal stage followed by a red macular eruption and desquamation. It is attended by little if any systemic disturbance.

Etiology.— There is no known specific microorganism. The disease spreads with great rapidity, the contagium taking place on slight contact. It is conveyed by direct contact, and is probably not carried by a third person. One attack usually protects, but it has occurred in the same individual a number of times. Neither scarlet fever nor measles render immunity, as it seems to bear no relation to these diseases.

Pathology.— There is no specific pathology.

Symptomatology.— After an incubation of between two and three weeks, during which there are no symptoms, a slight coryza or sore throat develops with a temperature rarely over 101° F. In a great many cases these prodromal symptoms are wholly lacking, and in about 50 per cent. there is no temperature at any time. There is rarely more than a slight indisposition and loss of appetite. On the first or second day the eruption appears. Often a premonitory general blushing of the skin, fading in a few hours, with small discrete macules, deep pink in color, are seen on the face.

These rapidly spread to the thorax, and thence within twenty-four hours to the rest of the body, but they are much more numerous on the face than elsewhere. The eruption never reaches its height in all parts of the body at the same time, as it begins to fade on the face before the extremities are reached. The throat is reddened. If there has been any fever it disappears soon after the eruption comes out. In two to four days the eruption has faded, and a slight brownish staining of the skin, with slight desquamation, is at times seen. The posterior and occipital lymph nodes are very constantly enlarged, even before the appearance of the eruption, and confirm the diagnosis. Hess showed that in almost all cases of German measles there was a definite increase in the lymphocytes, even preceding the appearance of the exanthem. This fact should be utilized in institutions where an epidemic is in progress to separate the infected from the non-infected children.

Prognosis.— Recovery after a short mild course is to be expected.

Treatment.— This is, as a rule, mainly symptomatic. Beyond a liquid diet and sponging with alcohol very little is required. In severer cases the treatment given under Measles may be appropriately followed. The children are isolated for a period of two or three weeks, and their surroundings should be such as described under Measles.

Scarlet Fever.

(*Scarlatina.*)

Definition.— Scarlet fever is an acute infectious, and contagious disease, characterized by a sudden onset, vomiting, and a generalized scarlet rash, accompanied by high fever.

Incubation.— Varying periods of incubation are recorded. In our experience two to seven days after exposure the symptoms appear. The German authors give an incubation period from eight to eleven days.

Etiology.— The specific causative factor is still unknown. It occurs more often between the ages of one to five. The incubation period is the least contagious, while the eruptive stage is the most contagious. The stage of desquamation was formerly considered the period of greatest danger. One attack, as a rule, protects the individual from subsequent attacks. The immediate neighborhood of the patient is probably a contagious zone. The secretions, particularly of the nose and throat, are active in carrying the infection. It is not now believed that the desquamated epithelium is the principal agent in the spread of the disease, as was formerly taught.

Pathology.— The lesions found vary greatly with the intensity of the infection, and are due to the action of the scarlatinal toxin (streptococcic) or to a mixed infection. The heart muscle and the kidneys show degenerative changes in complicated cases. The cervical glands are found hypertrophied.

Symptomatology (Simple Form).— Vomiting is usually the first symptom. Convulsions may usher in the disease in younger children. The child has fever and within twenty-four hours the rash appears, first upon the neck and chest. It is bright in color, diffuse, pin-point, with no areas of healthy skin in between; it rapidly spreads downward to the arms, trunk, and legs. The face is not as much affected as the rest of the body. Sometimes hardly any rash appears there. The rash is accompanied by a variable amount of pruritus. The tongue is coated quite heavily and often has the so-called raspberry appearance, due to the injection of the papillæ. Later the tongue takes on a red beefy appearance, when the coating disappears. The fauces and tonsils are congested. The fever ranges from 102° to 104° F., with a rapid pulse. The glands in the cervical region are tender and often become swollen, especially in the later stages of the disease. The urine will show traces of albumin, which is often only temporary. It is apt to be scanty and high colored.

The blood shows a leukocytosis, while a differential count may assist in the diagnosis by showing an increase in eosinophiles quite early in the disease.

Desquamation.— This begins with the fading of the rash about the second or third day. The skin appears in fine scales, usually seen first on the face and about the joints, then over the body. On the hands often large sections of skin are shed. The process lasts many days, sometimes weeks, but can generally be assisted by the treatment given below.

Anginal Form.— The tonsils and retropharynx are congested. The tonsils may show exudation in their lacunar spaces, and the cervical lymph-glands are much enlarged. In another form, a membrane may be present on both tonsils, spreading to the adjacent fauces, and gave rise to the false term of diphtheritic scarlet fever. It is due to a streptococcic infection, and should be regarded as the septic form of this disease, as in these cases there is always more or less general systemic infection.

The fever in this form is usually of a remittent character and will be influenced by any complications that may arise. The severe forms cause prostration, stupor, or profound coma. The temperature remaining about 105° F. with rapid pulse. The urine is scanty and high colored. Deglutition is extremely difficult. There is marked restlessness. The membrane may invade the nose or larynx, the lips are fissured and excoriated, while the breath is extremely fetid.

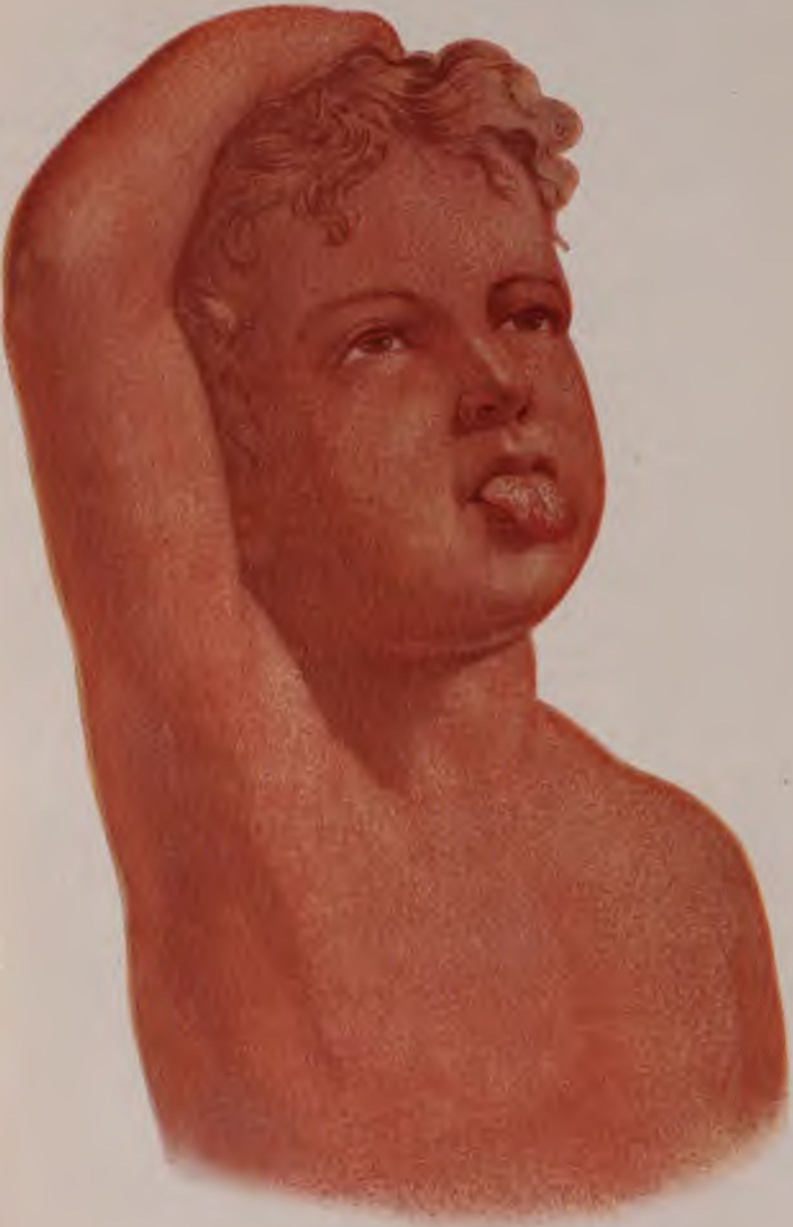
Routine examination of the ears will show some degree of involvement in more than a fifth of the cases; if the patient goes on to recovery the lymph-glands are apt to degenerate with the formation of abscesses. Meningeal symptoms may precede a fatal issue.

The mastoid cells may become diseased after convalescence has set in. Septic thrombosis and cerebral abscess are fortunately rarer complications. The otitis media of scarlet fever may persist, and become the cause of partial or absolute deafness.

Kidneys.— Modern methods of urine examination will show traces of albumin and a few hyalin casts even in mild attacks. This should not be regarded as a true nephritis. The septic form of the disease through the agency of its toxins is more likely to be complicated by a true nephritis.

Puffiness of the eyelids and face, edema about the ankles spreading to the rest of the body will be the first objective signs. The urine then persistently contains albumin and mixed casts, with a high specific gravity. The nephritis usually lasts through a protracted convalescence or may become chronic. Uremic symptoms begin with vomiting or convulsions, sometimes only convulsive movements are observed. Coma with feeble heart action are symptoms of grave peril.

The Rash.— The development of the rash, usually after twenty-four to forty-eight hours, offers considerable information of value in differentiating scarlet fever from the confusing erythematous eruptions. The examiner should place his patient in a good white light. A magnifying glass and a glass slide, such as is used for blood and sputum, will be found to be exceedingly helpful in studying the exanthem. The rash first makes its appearance on the sides of the neck, upper part of the chest and face; thence spreads to the arms, upper part of the back, and finally involves the trunk and lower extremities. Its color is not scarlet, but a dull red, almost a brownish-red (Fig. 3, Plate IX). This color varies proportionately to the fever, being more marked usually in the evening. The general characteristics of this rash about to be described will always be found present in a true case of scarlet fever, even though certain modifications or variations are observed. Close inspection of the rash resolves it into two factors, which are constantly present: 1. An erythematous background; 2. small, deep red, injected puncta (Fig. 5, Plate IX). Sometimes variations in the rash just described are present which give a diffuse, a mottled, or a speckled appearance. These changes are caused either by the closer merging or by the non-extension of these puncta with their erythematous areola. A normal or pale flesh tint is seen on pressure with a glass slide early in the disease, while later there is a dirty, yellowish-red pigmentation. Itching is quite a constant symptom, but is more marked when many groups of miliary vesicles are present. At the height of the eruption it is often possible to find small pin-point, conical, whitish vesicles, with a serous content, over the chest and lower abdomen (Fig. 1, Plate IX). When they occur in groups about the axillæ or in the groins, they are quite confirmatory from a diagnostic standpoint. The harsh, uneven feel which the rash occasionally gives to the hand passed over the skin is due to papular or even vesicular elevations occurring at the sites of the hair follicles. This papulation affords



Rash of scarlet fever.

another valuable aid, as it does not disappear with the erythematous rash, but the roughness of the skin persists after it has faded.

Certain regional characteristics are present in this exanthem, which, if appreciated, tend to help the puzzled physician. The face, for example, shows the true rash only on the temples; the cheeks are profusely red, but the nose, chin, and upper lip appear unduly pale, causing a circum-oral pallid ring which should be sought for in suspected cases, as it is not present in the counterfeiting rashes.

The flexor surfaces of the joints deserve careful scrutiny and special mention. These regions rarely exhibit the characteristic rash; they are apt to be the site of petechial hemorrhages or else they have a blotchy appearance.

If the palms and soles are examined with the magnifying glass, no puncta are seen, only a simple erythematous blush.

Desquamation.— In the exfoliation of scarlet fever we expect to find it occurring in the order of the appearance of the exanthem. At first there are observed fine discrete scales in the infraclavicular and episternal regions (Fig. 6, Plate IX). These scales are made up of the epidermal covering of the above-described puncta and vesicles. When desquamation first occurs flakes having a perforated center are cast off. This is known as "pin-holing." Later, and continuing for five to seven weeks, the skin becomes rougher, throwing off irregular rings of desquamation of varying extent. The large strips of epithelium and casts of the hands and feet, which are sometimes shed or torn away, are more often seen in those subjects who have a skin of coarse texture.

Another diagnostic feature of this stage of desquamation is seen in the finger-nails. If the pulp is pushed back from the nail, there will be seen just beneath its free border a scaling or cracking line which extends up to the fingers. Four to five weeks after the beginning of the disease we may find a transverse linear groove, sometimes with a corresponding ridge, which shows itself on the roof of the nail. The thumb-nail exhibits this condition better than the fingers. These nail changes serve as corroborative evidence in the subsequent diagnosis, and this desquamation may be seen on the nails when other evidences are not found elsewhere. On the other hand, it must not be forgotten that the desquamation may be so slight as almost to escape notice. Unfortunately, desquamation alone is often regarded as sufficient evidence of the disease, and a diagnosis is based thereon. In view of the fact that so many of the erythematous eruptions produce skin exfoliation, we are not justified in this conclusion, unless we have (1) the regional involvement, (2) the pin-holing, and (3) the nail changes, plus other pertaining clinical symptoms.

THE TONGUE.— The tongue in the first days is usually thickly coated, and the papillæ are obscured, but as the tongue clears up at the edges and tip, we can observe the enlarged papillæ (Fig. 4, Plate IX), which become more and more prominent, and show at their best about the fourth day. The lingual mucous membrane now begins to exfoliate; the tongue becomes red, dry, and glistening. It is in the posteruptive stage that this feature is particularly of diagnostic importance.

THE BLOOD.— The blood in scarlet fever has been carefully studied, and may be of service in obscure cases, as an additional confirmatory link. The red blood-cells are gradually diminished throughout the course. A leukocytosis is present a day or two before the appearance of the rash, and the normal is regained only in convalescence. We have found this leukocytosis to be proportionate to the severity of the angina. The polynuclears are increased and the mononuclears decreased, both relatively and absolutely. To the eosinophiles we may look for some rather characteristic variations. In the initial stages they may disappear almost entirely, while in defervescence, and later to the sixth or seventh week, 8 to 12 per cent. may be counted.

Differential Diagnosis.— *The Erythemata.*— Erythematous eruptions which may simulate the rash of scarlet fever are quite common; and if a careful examination and study of the rash is not made, weighing with it all the clinical evidence, mistakes are easily made. The simple form of erythema results from external irritants, while the exanthem of angioneurotic origin results either from systemic disturbance, ingestion of certain drugs, or from specific poisons. These fortunately have certain characteristics which should be borne in mind, for while we are not always able to distinguish them one from the other, the differentiation from scarlet may be thus made possible.

One of the striking features is the tendency to recurrence, and undoubtedly many of the so-called second and third attacks of scarlatina have been in this class. In a general way these dermatoses are distinguished by the following peculiarities: They may appear in any region of the body — at one time there may be present in the erythema elements of the various exanthemata. Their type may rapidly change so that they may be scarlatiniform one day and morbilliform the next. The puncta seen in the scarlet fever exanthem are absent. Desquamation is coarse and flaky, and recurrences are frequent.

Erythema Scarlatiniforme.— This is a non-contagious dermatitis, simulating scarlet fever in its cutaneous manifestations. It is liable to occur secondarily to other infectious diseases and to medicinal and food intoxication. As it is important to differentiate the disease from scarlatina, its distinguishing features will therefore be given.

This erythema spreads very rapidly, sometimes reaching its height in a few hours. Patches of erythema may alone be present. Under the glass there is no uniform redness. The face is rarely involved and the tongue shows no "raspberry" appearance. The fauces may be red, but are not swollen. Desquamation takes place at an early date after the erythema, sometimes on the second day; it is a quick process and the scales are large, abundant, and furfuraceous. The course is brief, and there are no complications or sequelæ. Such a clinical picture, especially in a child who has given a history of previous similar attacks, should exclude scarlatina. A scarlatinoid erythema may follow the use of such drugs as belladonna, quinin, chloral, chloreton, salicylic acid, antipyrin, digitalis, opium or veronal, especially in those patients having a drug idiosyncrasy. These eruptions almost invariably follow very quickly after the ingestion of the drug. We have seen it occur within an hour after a dose of antipyrin. The close relationship to the drug taking is a diagnostic feature of considerable value. Belladonna rashes are perhaps most often seen. This eruption is usually confined to the face, neck, and chest, and is only rarely generalized. It fades quickly and is rarely followed by any desquamation. The absence of fever, the dilated pupils, the evanescent rash and the history should cause no confusion.

It is well to recollect that drug rashes in general, and in contrast to scarlet fever, appear for the most part on the extensor surfaces of the extremities, and if they be present on the face, then the circumoral ring is not observed. Moreover, they are not associated with fever, angina, or adenitis. If any doubt still exists, the repetition of the dose of medication under suspicion should be given to reproduce the erythema.

Acute Exfoliative Dermatitis.— Another disease which may raise a veritable doubt in the stage of efflorescence or in the desquamative period is acute exfoliative dermatitis. It differs in that the constitutional symptoms are more pronounced than in scarlatinoid erythema, while the eruption appears as a general hyperemia very soon covering the entire body. The exfoliation follows in a day or two, and is general in character and intensely profuse; large papery strips being cast off (Fig. 8, Plate IX). The nails and hair may drop out before the process is complete.

Another disease which necessitates correct interpretation is the *scarlatiniform variety of rubella;* fortunately, this is not a common type (Fig. 7, Plate IX). Close inspection of the rash will disclose morbilliform characteristics. The mild constitutional symptoms and the enlarged postcervical glands of rubella will define it.

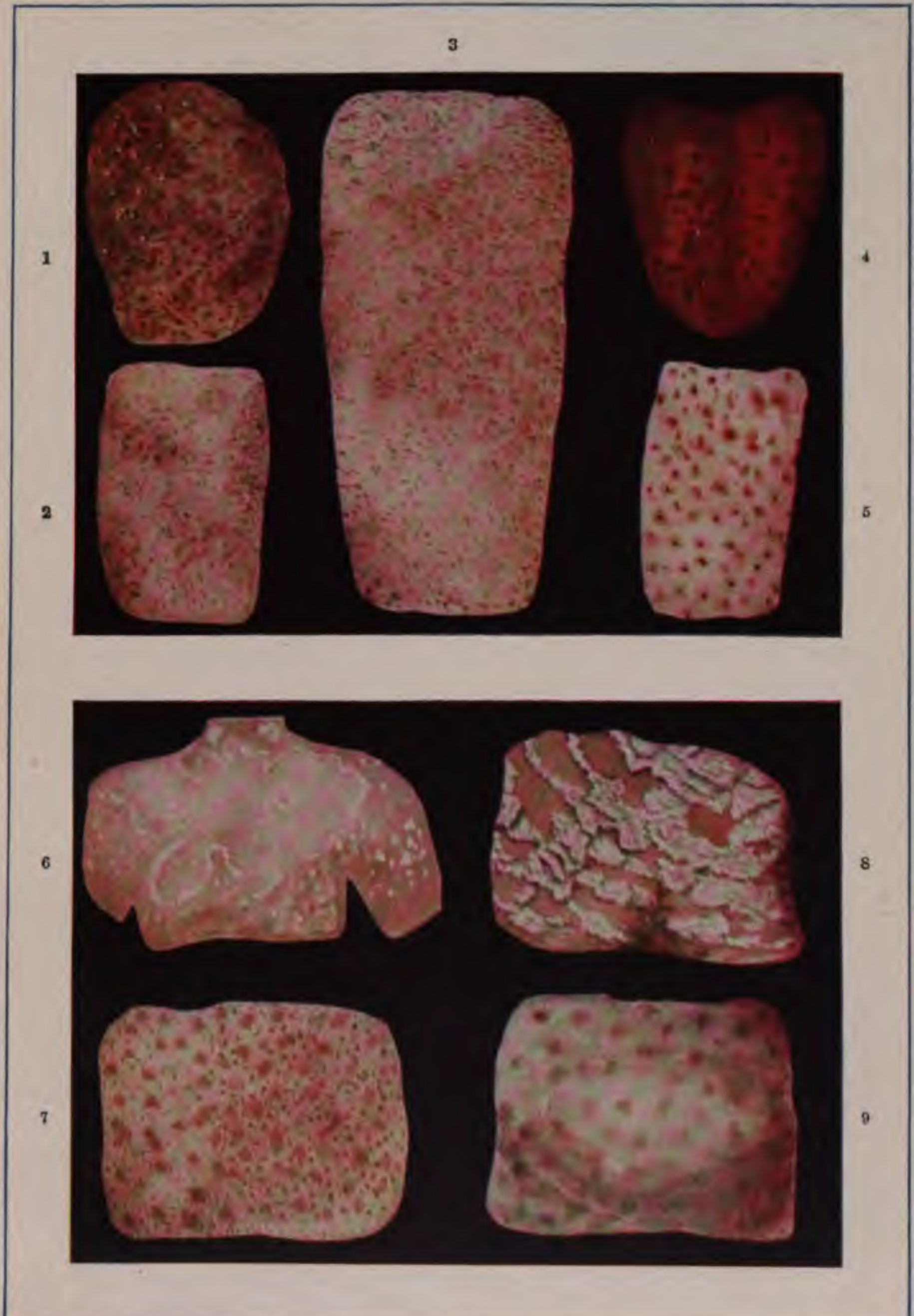
Serum Rashes.— The use of antitoxic serum may be productive of a scarlatinoid rash that is very puzzling. This is especially true when antidiphtheritic serum has been injected. The angina of the diphtheria is already present and cannot assist us, while fever and malaise supervene. We must then depend upon the following facts: That the rash frequently spreads from the site of the injection; that these rashes are often polymorphous in character and fleeting in duration. They appear on the third or fourth day, the eruption occurs usually in patches and only rarely appears on the face. A well-marked enlargement of the superficial lymph-glands in the inguinal, axillary, and epitrochlear regions will also help to distinguish this rash from scarlatina.

Open wounds and especially burns are liable to direct inoculation. Many of the so-called cases of "surgical scarlet" of the older writers were probably scarlatinoid erythemas or what we now recognize as septic rashes. For our guidance in differentiation the wound is of considerable help; an erstwhile healthy wound may begin to look unhealthy, and an exudate may form upon it. The rash is very likely to first appear at or near the wound. The nearest lymphatic nodes will be found tender and enlarged. Vomiting may occur, but sore throat is rarely complained of. There are no characteristic changes in the desquamation.

The septic rashes which were referred to above occur more often in early life, and either precede or accompany a definite septicopyemia. Occasionally they may indeed be the first to call attention to the true condition of the patient. When the rash is small and macular, it may resemble scarlet fever. Its spotted character and the large macules which are seen on the extensor surfaces of the extremities with absence of puncta fix the diagnosis (Fig. 9, Plate IX). A high leukocytosis would be confirmatory. From erysipelas, scarlatina can be distinguished by the shining, glazed appearance and characteristic spreading.

The Fourth or Duke's disease is of interest in this connection because of its confusion with scarlet fever, provided we accept the dictum that attacks of the Fourth disease do not protect the individual against scarlet fever and measles. The disease is described as differing from scarlet fever in its longer incubation period, absence of prodromal symptoms, such as vomiting, high pulse rate, and severe angina. The rash itself shows but

PLATE IX.



The differential diagnosis of scarlet fever and the Scarlatiniform eruptions. 1. Scarlet fever rash showing sudaminal vesicles. 2. The fading scarlatina eruption. 3. Scarlatina eruption, early stage. 4. Typical scarlet fever tongue. 5. The scarlet fever rash, magnified. 6. Scarlet fever desquamation. 7. The scarlatinal form of rubella. 8. Acute exfoliative dermatitis. 9. Erythema fectiosa. (Pisek's original plate; courtesy Archives of Diagnosis.)

little difference except that it usually begins on the face and is not extensive. The desquamation, however, is profuse and out of all proportion to the exanthem. Renal complications do not occur.

As the practitioner is often called upon to offer a diagnosis at different stages of the disease, the distinctly helpful phenomena to be observed at various stages in scarlatina will be given.

PREERUPTIVE STAGE.— Here the diagnosis is only rarely possible and then it can be made only in the presence of an epidemic and a history of contagion. The sudden invasion with an angina, bright red puncta seen in the roof of the mouth, and initial vomiting without satisfactory cause, may be symptoms anteceding the eruption. The polynuclear cells are increased, while in rubella the lymphocytes appear in greater numbers.

ERUPTIVE STAGE.— The diagnosis is at this period rarely obscure. The vomiting, high pulse rate, characteristic punctate rash, congested fauces and evidences of the " raspberry " tongue are usually conclusive.

PREDESQUAMATIVE STAGE.— The rash has faded or disappeared, and desquamation has not yet begun. Here the distinctively glazed, papillated tongue and the injected fauces are seen. The enlarged lymph nodes beneath the maxilla are tender to the touch. The skin looks dirty yellow under a glass slide, and has a distinctly dry and uneven feel. Sudamina or miliary vesicles may be present in groups.

DESQUAMATIVE STAGE.— When the disease is seen late, exfoliation beginning on the face may be found on the fourth to the sixth day of the disease, and on the neck and chest about the twelfth to the fourteenth day. On the palms of the hands and soles of the feet it persists sometimes for weeks; this possibly serving to differentiate it from the scarlatiniform erythemas. " Pin-hole " scaling on the body and the lines on and beneath the finger-nails strengthen the diagnosis. It is not uncommon to find still further corroborative evidence at this stage in complications of the kidneys, joints, in the ear or in suppurating cervical glands.

Prognosis.— In the mild cases this is extremely good. The septic cases in the epidemics raise the mortality. In this country the mortality in several epidemics averaged 3 per cent. Nephritis is the most common complication and often a fatal one through uremia; the chronic form reacting badly to treatment and often ending in death. Otitis and its complications may result in deaf-mutism or have a fatal issue through the involvement of the brain or sinuses. The involvement of the serous membranes of the heart or joints tends to a grave prognosis. The older the patient the better the prognosis.

Treatment. Prophylactic.— The routine examination of school children which is now practised in a number of the largest cities will notably tend to diminish the number of scarlet fever cases and prevent epidemics. Isolation should be insisted upon, and be carefully carried out even in mild or suspected cases. Children or even adults who have been subject to pharyngitis or tonsillitis are more likely to take or spread the infection. Air and sunlight should be regarded as the best disinfectants.

Children from whom enlarged tonsils and adenoids have been previously removed are less liable to such complications as otitis and sinusitis.

Sick-room and Quarantine.— A quiet sunny room that can best be used for purposes of isolation should be selected. An open fire-place is preferable to any other form of heating.

All unnecessary furniture should be removed, a gown or sheet and a bowl of bichlorid of mercury (1/1000) should be placed in readiness in an empty closet outside of the room for the use of the doctor.

During convalescence toys of little value, that can be burned, should be provided so that the period of quarantine, which is usually six weeks, may not be too irksome for the child.

Disinfection can be carried out as described on page 300, when the patient is ready to be discharged.

Routine Measures.— All cases of scarlet fever, whether mild or severe, should be regarded as dangerous, as the complications and sequelæ may permanently injure the patient. Skilled nursing will do more to promote the comfort, progress, and the prevention of complications than remedial measures. If circumstances will not permit of a trained nurse, some one member of the household should be put in charge and given careful instructions as to the quarantine regulations and written orders for the patient.

The diet should consist wholly of milk in the first few days of the illness, later, for the sake of variety, fruit juices, whey, buttermilk, or matzoon may be added or substituted.

When convalescence is established, gruels, crackers, well-toasted bread, and apple sauce may be added to the dietary. Vegetables and eggs are allowed in the fourth or fifth week if there is no fever or other contra-indication. Water should be offered often and freely throughout the illness.

The skin should be anointed with a 5 per cent. boric acid ointment or with liquid albolin daily as soon as desquamation is established. If the pruritis is troublesome a 1 or 2 per cent. carbolic acid ointment will be effective in its control.

The nasopharyngeal toilet should be made daily with a mild alkaline antiseptic or a normal sal [illegible] method employed will depend upon the age of the child. Those who are old enough and willing may gargle. A spray or irrigation is necessary for the obstreperous or septic cases. The solution may be instilled with a medicine dropper into the nares of infants.

The Urine.— A specimen should be obtained for examination (see Methods, page 425) three times a week. If this is done the complicating nephritis will be detected early and proper measures can be taken at once.

Symptomatic Treatment.— The fever, if high, above 104° F., can be controlled by sponging with water 85° to 90° F. every two or three hours. Cool packs are rarely necessary except in those cases in which there is considerable restlessness and delirium. The child may then be wrapped in a sheet as described on page 70 and left in this for a few hours if sleep is produced.

Heart.— Persistent high fever, especially in the septic cases, may weaken the action of the heart so that the pulse becomes soft and somewhat irregular. The first sound is not distinct and the pulse rate becomes high. Stimulation with strychnia alternating with the tincture of strophanthus is now indicated. Alcohol in the form of sherry wine (vini xerici) may be substituted profitably in the septic cases. One to two ounces may be given freely diluted in water during the twenty-four hours to a five-year-old child. Normal salt solution, two to three ounces, given by hypodermoclysis may tide over a critical period.

The bowels are kept open preferably with the effervescent citrate of magnesia. Constipation, which is so often present on a strictly milk diet, will not be so troublesome if the dietary is varied as outlined above. The milk of magnesia may be added to the bottle in infants.

Complications and Sequelæ.— The cervical adenitis which so often occurs requires the use of ice-bags or compresses of a saturated solution of magnesium sulphate in the early stages. Ichthyol ointment 20 to 30 per cent. in lanolin is applied daily when the acute symptoms have subsided. The abscess must be incised and drained if fluctuation denoting suppuration is detected.

Nephritis will necessitate the continuance of a liquid diet, alkaline diuretics, or such drugs as diuretin or agurin, and in the graver cases high colonic irrigations of saline solution twice a day until the normal amount of urine in secreted.

Otitis.— The ear drums should be examined every other day as a routine measure, and any redness and bulging should receive prompt treatment by incision and drainage as outlined on page 532. If this is done, chronic otitis and mastoid infections with their sequelæ may be avoided.

Arthritis occasionally occurs as a complication which prolongs the convalescence, and if neglected may cause joint deformities. Arthritis at times occurs as a complication, usually in the third week. A normal convalescence may be disturbed by a rise of temperature which cannot be accounted for. In about 24 hours the patient may complain of pain in the joints, principally the knee, the wrist, or the joints of the fingers being affected. The pain is best elicited by transverse pressure across the joint. We have occasionally observed a fine erythematous rash preceding the arthritis. Prolonged hot baths and the application of a saturated solution of magnesium sulphate give most relief. Small doses of aspirin are sometimes needed.

The Serum Treatment.— Except in those cases which by culture give evidences of an added Klebs-Loeffler infection, serum therapy as thus far elaborated is without value. Diphtheria antitoxin should be administered in those cases in which a true diphtheria is present, clinically or by culture.

Small-pox.

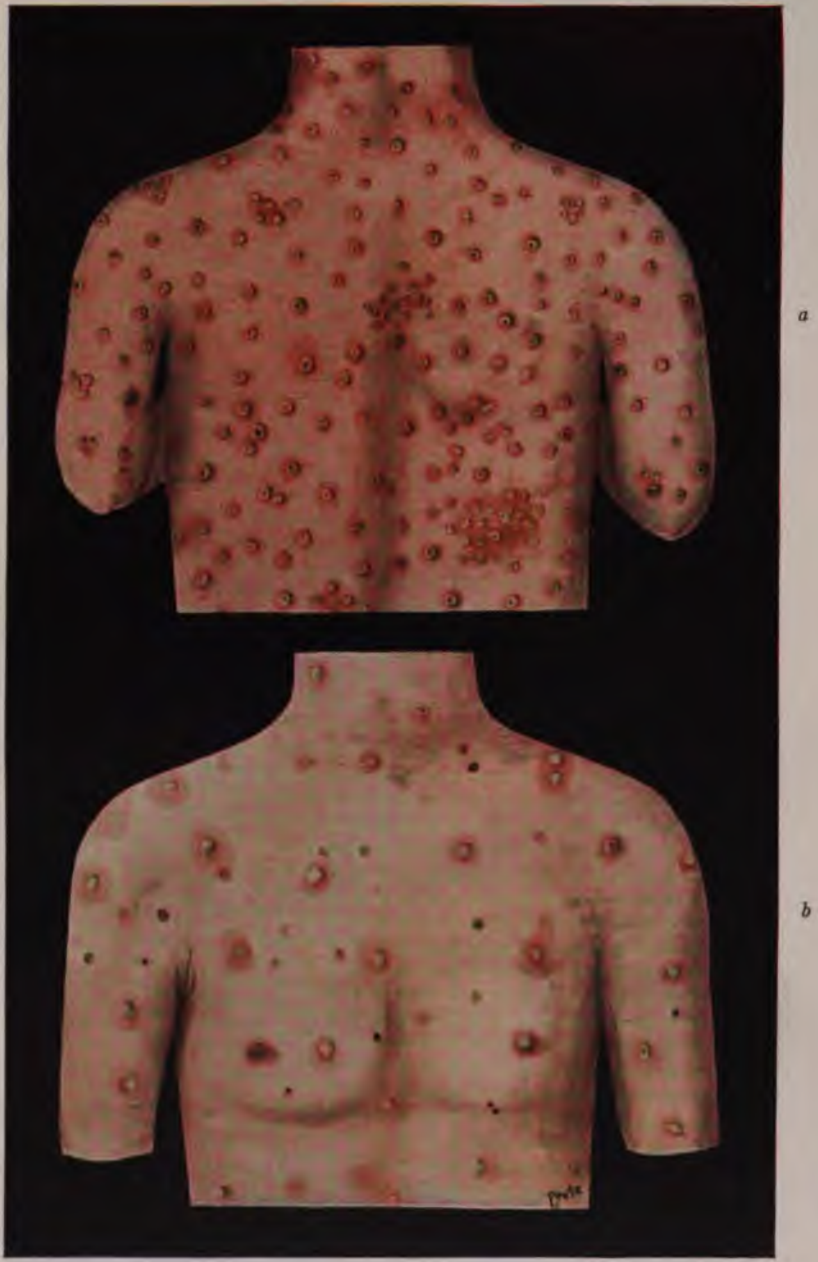
(*Variola.*)

Definition.— Small-pox is an acute contagious disease characterized by a period of incubation, a prodromal stage with intense constitutional symptoms, followed by a progressive eruption of macules, papules, vesicles, pustules, and cicatrices.

Etiology.— Specific.— Councilman in 1903 discovered a protozoan in the skin of small-pox patients. The relation of these parasites to the skin lesions is of such a definite and intimate character as to lead to the conclusion that they are the cause of the disease. They have a double life cycle, intracellular and intranuclear, which they undergo in the epithelial cells. In the first cycle they are small homogeneous bodies found in vacuoles in the cells of the lower layer of epithelium, and develop there into large ameboid multi-chambered organisms, destroying the epithelial cell and by segmentation breaking up to form the protozoa of the second cycle. These invade the nuclei of other epithelial cells and continue their growth until the cell is destroyed. The parasite has not been found free in the vesicle contents, nor anywhere, as yet, except in prepared sections of the skin.

Non-specific.— The contagium exists in the secretions and excretions, in the skin lesions, and in the dried scales and crusts that come from them. It clings to everything with which it comes in contact, and may therefore be transmitted by a third person; all public places are thus dangerous for an unvaccinated individual during an epidemic. It is probably contagious during the prodromal stage as [illegible] the course of the eruption

PLATE X.



Differential diagnosis of variola and varicella. (*a*) variola; (*b*) varicella.

and desiccation. A very virulent case of variola may be contracted from the mildest varioloid. Vaccination protects for a variable time (six years to a lifetime) in different individuals, and always lessens the danger and severity of an attack. One attack protects for life.

Pathology.— The papule is seen to be a focus of coagulation necrosis in the rete mucosa, surrounded by an area of active inflammation. The vesicle is made up of numerous recticulæ and spaces which contain serum, leukocytes, and fibrin. When the pustule involves the true skin a permanent scar results.

Incubation.— Twelve to fifteen days.

Prodromal Stage.— Three or four days.

Symptomatology. Description of Prodromal Stage.— This is ushered in with convulsions, vomiting or a chill, and in older children severe frontal headache and backache are complained of. The temperature quickly rises from 103° F. often to 106° F. The pulse becomes rapid and full, and within twenty-four hours there may be delirium and marked restlessness. This condition continues with no diagnostic signs on the skin usually for four days, when the eruption appears. Simultaneously there is a fall of temperature even to normal in the less severe cases, and marked improvement in the general symptoms.

The Exanthem.— At first the exanthem is in the form of small raised red papules, most commonly developing on the forehead, particularly at the junction with the hair, and on the wrists. They rapidly extend to the rest of the face and to the extremities, including the palms and soles, and in less numbers to the trunk. They all come out in one crop within twenty-four hours. They feel hard and have the so-called "shotty" touch, because they extend deeper into the skin than other papules, as, for instance, those of chicken-pox. These same red papules are to be seen on the hard and soft palate and pharynx, causing an accompanying sore throat. In two days, sometimes less, the papules on the skin become vesicular, with a slight depression in the center of each vesicle, and if pricked with a needle they do not collapse because they are divided into many parts by a reticular construction. They still have an indurated reddened base. On the eighth day of the disease, four days after their first appearance, the vesicles become full and rounded and the serum in them changes to pus. The skin becomes tense and swollen, and the individual lesions enlarge, so that in the severe cases (confluent form) they coalesce and the face appears much swollen and changed beyond recognition. This is accompanied by a second rise of temperature (secondary fever), and a return of the constitutional symptoms with redoubled vigor. The delirium returns, the pulse grows weaker, and the patient shows every sign of a severe intoxication. In the fatal cases this may go on for two or three days with increased severity until death results. But in the milder cases, within twenty-four to thirty-six hours after maturation takes place, the pustules break and the pus exudes, and on the tenth or eleventh day the temperature begins to fall by lysis. The pustules rapidly dry with the formation of crusts, and usually during the third week the temperature becomes normal and the desiccated pustules alone remain. These may adhere for a week or longer until at last they fall off and leave the scar or pit which may, especially in the confluent form, be carried throughout life. A leukocytosis occurs in the pustular stage, but at no other time unless there is some complication to cause it.

Variations, Complications, and Sequelæ.— There are really four forms of small-pox, differing chiefly as to their severity: varioloid, discrete, confluent, and hemorrhagic small-pox. Varioloid is a pox modified by a previous vaccination, and does not often occur in children, since a child that has been successfully vaccinated is generally immune until after puberty. The mild discrete form is also unusual, because in unvaccinated children small-pox is apt to run a very severe course. These two forms are mild and differ only in degree. The symptoms are all milder than in the other two forms, although the initial temperature may be high. The papules are fewer in number, particularly on the face, and do not coalesce. The disfiguration is less. There is less secondary fever from suppuration (in varioloid often more) and convalescence is therefore much more rapid. In the confluent form the eruption is apt to appear earlier, about the third day, with a lesser fall of temperature upon the advent of the eruption. There is more swelling and distortion of the features during the suppurating and coalescing stage and more pain. Delirium, ceaseless, restless movements, and other nervous manifestations are prominent in children. Diarrhea is also peculiar in children. The larynx and pharynx may be greatly swollen. Edema at times being the cause of death through suffocation. The cervical glands are much swollen and may suppurate. Hemorrhagic small-pox may show itself either before the real eruption appears or at the time of suppuration and secondary fever; the earlier the hemorrhage, the greater the danger. At first there are small punctiform hemorrhages. They rapidly increase in size, and soon hemorrhages appear from the mucous membranes, hematemesis, hemoptysis, epistaxis, and hematuria develop. Large conjunctival hemorrhages with deeply sunken cornea complete the picture. The pulse is rapid and the respirations frequent. On the other hand, hemorrhage into the vesicles themselves, with abortion of the rash and speedy recovery even in cases that were previously considered severe, have been noted.

Other complications are edema or necrosis of the larynx, which may be fatal. Bronchopneumonia is common, while heart and kidney complications are rare. Arthritis going on to suppuration, and acute necrosis of the bones have occurred. The eye may be permanently injured by inflammatory changes. Otitis media may complicate. Boils, acne, and ecthyma are apt to be troublesome sequelæ.

Prognosis.— The matter of previous successful vaccination is the most important item in the course and termination of small-pox.

In one large epidemic the mortality of the unvaccinated was 54 per cent., while that of the vaccinated was $\frac{1}{3}$ of 1 per cent. In children it is particularly fatal. Of 3,164 deaths in the great Montreal epidemic, 85 per cent. of these were in children under ten years. The younger the child the more serious the course, and the more fatal the outcome. The hemorrhagic form is almost invariably fatal. The more numerous the lesions on the face the more grave is the prognosis, as is seen in the high mortality of the confluent form. High fever, delirium, continued convulsions and other nervous symptoms are particularly dangerous. Laryngeal and pulmonary complications are very fatal in children.

Prophylaxis.— Vaccination is the measure which, if thoroughly carried out, would eradicate this disease.

The strictest quarantine regulations must be enforced even in suspected cases; all individuals exposed are to be immediately vaccinated. The demand of school boards that all children be frequently vaccinated has been followed by the most satisfactory results.

Treatment.— If the patient has not been vaccinated, and is in the incubation stage, the ravages of the disease may be prevented and only a mild course observed, if he be immediately vaccinated. The high fever is controlled by cold sponging and the use of the ice-bag under skilled supervision. The racking pains are best controlled in children by Dover's powders. Water is freely demanded and should be freely given. Convulsions and other nervous phenomena may be prevented and relieved by insisting upon a cool temperature in the room; preferably at 65° to 70° F. The diet should be liquid during the febrile period. A 4 per cent. solution of boracic acid should be used for the eyes, mouth, and nose. A 2 to 5 per cent. ichthyol ointment will very effectively control the itching in the eruptive stage. A great deal may be done for the patient during the stage of suppuration. Welch, who has had a large experience, recommends the application of a mixture of olive oil and lime-water $\frac{1}{2}$ oz. each with carbolic acid ten to fifteen drops. Elbow sleeves will effectively prevent the child from scratching and thus causing pitting and disfigurement. Martin states that he can prevent pitting by treating each pustule by incision and drainage. The patient's strength is to be carefully watched and strychnin prescribed at the first signs of a weakening heart. In the convalescent stage, forced feeding will serve as the best tonic treatment.

Vaccination.

Definition.— Vaccination is the innoculation of an individual with the virus taken from the vesicle of a cow that has vaccinia or cow-pox.

Etiology.— It is now known that vaccinia is caused by a protozoan which resembles that of small-pox, but which differs from the latter in that it has only one life cycle, the intracellular form described under the etiology of Small-pox.

Value of Vaccination.— In the immense majority of cases vaccination renders the individual immune from small-pox for many years. Before it was generally practised terribly fatal epidemics swept over different parts of the world, carrying away enormous numbers of victims. Rotch stated that in the last fifteen years no deaths from small-pox occurred in Boston in children who had been vaccinated under five years of age, and at the same time the mortality in the unvaccinated was 75 per cent. Where small-pox is acquired after successful vaccinaiton, even years after, it is the mild form, called varioloid.

When to Vaccinate.— Every infant should be vaccinated preferably between the fourth and sixth months of life, before teething has begun and before the child can disturb the dressing. An acute or a severe chronic disease is a contraindication except in an emergency. Revaccination is advisable at puberty, and at any other time when the child has been exposed to small-pox or during a general epidemic. If an unprotected child is vaccinated within two days after exposure to small-pox, it will probably not contract that disease, and if vaccinated within five days thereafter the small-pox will be modified, and it will convert a possibly severe case into a mild one.

Method of Vaccination.— Only sealed tubes or quills should be used. Boys are vaccinated on the left arm at the insertion of the deltoid, girls on the thigh or calf. The skin is carefully cleaned with soap and water and a piece of sterile gauze. It is then washed with alcohol and allowed to dry. A large sewing-needle is sterilized by heating over a lamp. The skin is pulled taut without touching the place to be vaccinated and lightly scarified criss-cross without producing any bleeding. The vaccine is then unsealed, applied and gently rubbed in. It is next allowed to dry for twenty minutes, care being taken that it is not contaminated at this time. When dry a piece of sterile gauze is laid over it and firmly fastened with strips of adhesive plaster. Vaccination shields should not be used, as much contaminating dust and dirt may collect under them. The dressing should not be disturbed except by the physician for the purpose of seeing if the vaccination is successful and uncomplicated at the end of the week. It should be very secure in children who are old enough to tear it off. Vaccination should be attempted at least three times with a different lot of virus each time before one should say that the child cannot be successfully vaccinated.

Description of Normal Course.— The scarified area appears to be healing with no general symptoms until the third to fifth day, when a small papule develops at the sight of inoculation. This increases in size, and after one or two days develops into a large vesicle with a raised margin and depressed center, the whole surrounded by a red areola. By the eighth day it has attained its maximum, and on the tenth day the contents are purulent. The surrounding areola is extensive, swollen, indurated, and painful. The axillary or inguinal glands, according to the site of vaccination, are large and tender. On the eleventh or twelfth day the hyperemia diminishes and the pustule begins to dry up, and by the end of the second week only a brown crust remains which comes off in another week, leaving a round, pitted scar. Usually on the fouth or fifth day some fever and more or less marked constitutional symptoms develop and last three or four days. The vaccination has not been successful unless, 1. some reddened areola surrounds a typical vesicle; 2. there is some swelling of the lymph-glands; 3. some, even slight, fever and constitutional symptoms; 4. there should be a permanent scar in which even years after, numerous small pin-point-size depressions are seen. This last characteristic is very valuable in determining the success of a vaccination for a number of years after.

Variations and Complications.— The vesicle may abort and dry up in seven or eight days, in which case revaccination should be practised. Generalized vaccina at times shows itself at the end of the first week by a vesicular eruption in any part of the body. It may continue to make its appearance for five or six weeks. It is not serious, as a rule, but has been known to be fatal. Recurrences of the vesicle at the site of the original vaccination are rare. Reinoculation occurs in children who have scratched the original vesicle and then vaccinated themselves in different parts of the body.

Infection with other organisms results from, 1. contaminated virus; 2. lack of asepsis in vaccination; 3. traumatism and contamination during the vesicular stage. If the vesicle is not ruptured it is not liable to be contaminated, but with a sterile dressing over it there is double protection. The results of contamination may be ulceration more or less severe, or even an extensive necrosis; suppuration of the lymph nodes; septicemia or suppuration in the joints. Tetanus, syphilis, and tuberculosis are almost never seen now that animal lymph is used. Other complications are eczema, general urticarial and scarlatiniform erythematous eruptions. These may occur from the first to the fifth weeks.

Varicella.

(*Chicken-pox.*)

Definition.— Varicella is a short, mild, contagious disease, with a long period of incubation, a short prodromal stage, followed by an eruption of superficial papules going on to vesiculation. (See Pl. X.)

Etiology.— No specific microorganism has yet been discovered. It is an independent disease not closely allied to small-pox. It does not protect from small-pox, nor does small-pox protect from it. The disease is most common between the ages of two and six years, and is rare after puberty. It is communicable on slight, short contact, the mode of entrance not being known.

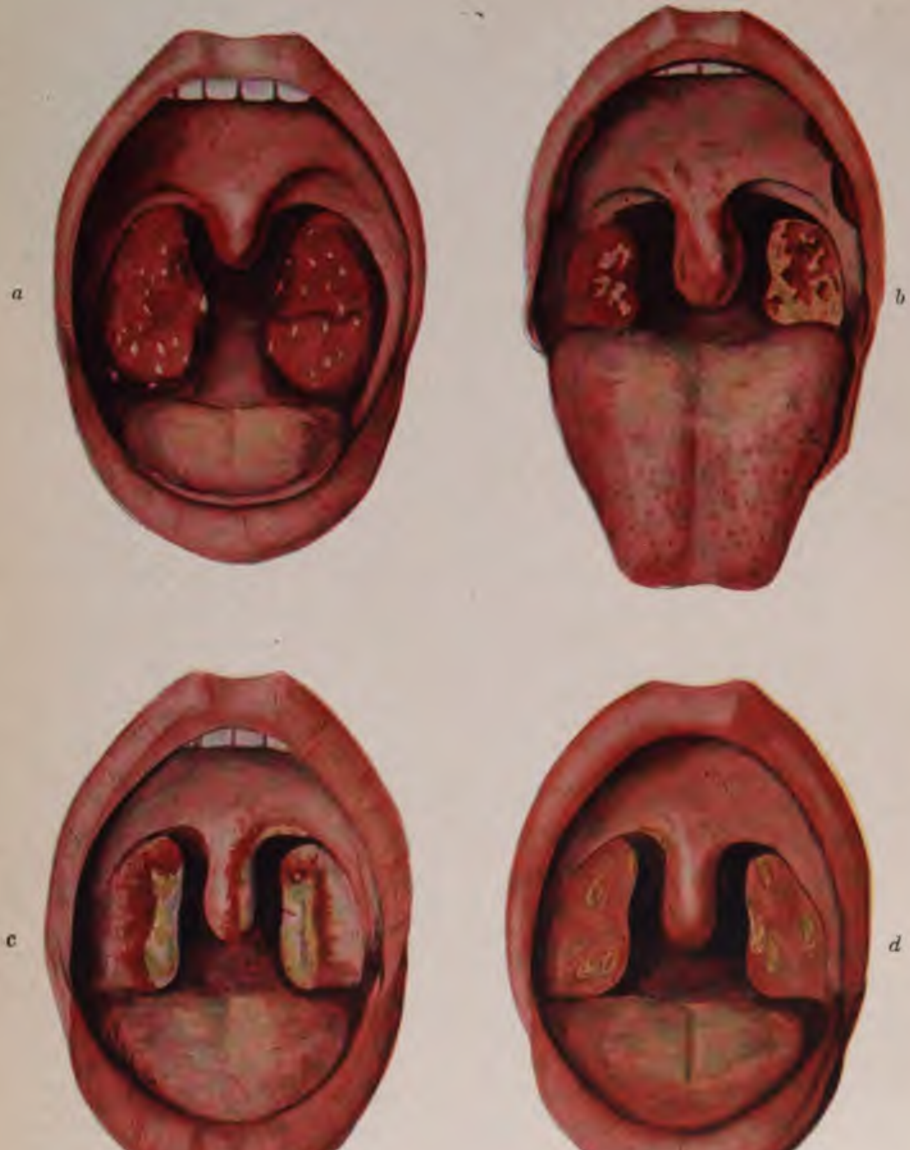
Pathology.— The papule and vesicle are near the surface, being formed by the upper layer of the epidermis. The vesicle is seldom multilocular, and unless deeper ulceration takes place, which occasionally occurs, it does not leave a scar.

Incubation.— Ten to eighteen days, usually fourteen days.

The prodromal stage lasts about twenty-four hours.

Description.— After a day of slight malaise, with perhaps a temperature of 101° F. to 102° F., a few red papules, varying from pin-head to pea-size, are seen anywhere on the body. Usually they are few in number and scattered over the face, trunk, and extremities. The temperature may be lowered a degree or more after the eruption comes out, but the patient still has some constitutional symptoms. A slight sore throat is the rule, as a few of the same isolated red papules appear on the fauces and pharynx. Within a few hours vesicles take the place of the papules which first make their appearance, and at the same time another crop of papules appears scattered here and there, between them. This process continues three or four days, so that at any one time the lesions in their various stages may be seen as small and [illegible] oning vesicles, large full rounded

PLATE XI.



Differential diagnosis of (*a*) follicular tonsillitis; (*b*) scarlatinal angina; (*c*) diphtheria; (*d*) lacunar tonsillitis.

TABLE OF EXANTHEMATA.

	Scarlet Fever.	Measles.	German Measles	Small-pox.	Chicken-pox.
Incubation	2 to 7 days. Usually 2 to 4 days.	8 to 12 days. Usually 10 days.	15 to 21 days.......	12 to 14 days.......	10 to 14 days.
Prodromal stage..	24 to 36 hours......	3 or 4 days.........	24 hours............	4 days..............	24 hours.
Throat and mucous membrane.	Intense hyperemia and typical punctate rash on fauces and posterior pharyngeal wall. Raspberry tongue.	Koplik's spots. Red throat.	Nothing typical.....	Red papules on palate and fauces.	Red papules on palate and fauces.
Distinctive prodromal symptoms.	Sudden onset with intense symptoms sore throat. Vomiting. Convulsions.	Gradual onset. Coryza. Cough.	Slight or none at all.	Sudden onset. Intense symptoms. Backache.	Slight malaise.
Character of eruption.	Uniform erythema with minute puncta.	At first isolated red papules coalescing with intervals of normal skin, giving a blotchy appearance.	Slightly raised red macules not coalescing.	Hard shotty papules in 2 days becoming umbilicated non-collapsable vesicles and in 4 days pustules. Total cycle, 6 days.	Papules rarely hard, becoming vesicular in a few hours. Seldom umbilicated always collapsable. Individual lesion completes cycle in 2 days.
Topography of eruption.	Appears first on chest, spreading to rest of the body. Least intense on face.	Appears first on face. Spreads to whole body.	Appears first on face. Spreads to whole body.	Appears first on forehead and wrists. Spreads on face, then on arms, scattered on trunk. All in same stage of evolution.	Irregular and general distribution comes in successive crops so that all stages may be seen at the same time in any one locality. As thick on trunk as on face.
Desquamation ...	Large flakes and sheets pin-holed.	Fine. Furfuraceous.	Slight or none......	Crusts and pits....	Crusts, no pitting.

vesicles, and those that are drying up. They may be an inch or two apart, or they may be much closer together. They usually have no umbilication, feel soft to the touch, and collapse when pricked with a needle. As a rule, they do not go on to pus formation, but contain a clear, or at most, a slightly turbid fluid. After two or four days they dry up, the temperature is normal, and convalescence is established.

Variations, Complications and Selquelae.— Many children show little or no constitutional symptoms. Rarely there may be a high fever, even to 105° F., and corresponding symptoms, but this is the exception. In some cases the eruption is profuse on the vulva and nates, with consequent vesical and rectal tenesmus. Occasionally one or two of the vesicles become infected and more or less deep destruction of tissue results. Cases of high fever and pustulation of all the vesicles, lasting a week or longer, have been reported. A depression in the center of each vesicle, that is, umbilication, is not typical, but it occurs often enough to be misleading in differentiating an atypical case from small-pox.

Albumin in the urine is not uncommon, but true nephritis is rarely seen, except in an unusually severe case. Acute simple inflammatory involvement of the joints, lasting only a few days, has been noted. Otitis and pneumonia are rare complications.

Prognosis.— Recovery is to be expected after a short mild illness.

Treatment.— To prevent the transmission of the disease, isolation from other children should be insisted upon, for although the disease is mild it occasionally produces some serious consequences. The child should be kept from scratching the vesicles to present infection by the finger-nails. An initial dose of 1 gr. of calomel, and a liquid diet, are the only measures, as a rule, required during the illness.

Diphtheria.

Diphtheria is an acute infectious disease due to the growth and action of the Klebs-Loeffler bacillus on a vulnerable surface producing a local membrane and general toxic symptoms.

Etiology.— The disease is endemic in large cities. Local epidemics frequently occur in small towns and villages. Statistics show the disease to be more prevalent in the winter and fall than in the summer months. In fact, vacation periods show a falling off in all infectious and contagious diseases. The disease is contracted directly or indirectly from another case of diphtheria or from diphtheria carriers. The indirect means are usually the handling of infected objects and attendants who do not take proper precautions. Ev food, such as berries and milk, have been known to infect the consumer. There is no discrimination as to sex; age, however, plays an important part. Nurslings possess considerable immunity. The third to fifth year is the period of greatest liability. From the tenth year to puberty, the susceptibility markedly decreases. Children of the so-called "lymphatic diathesis" are particularly vulnerable, as are those who have been weakened by previous diseases.

Pathology.— The pathology is in the main that of the pseudomembrane. This is a true coagulation necrosis, which may be situated upon the pharynx, nasopharynx, larynx, trachea, or bronchi. More rarely it is found upon the mucous membrane of the nose, conjunctiva, or vaginal membrane. The bacillus or its toxins circulating in the blood may produce myocardial changes of a fatty or degenerative nature. The cervical lymph nodes show a simple cell hyperplasia. The involvements of the lungs and kidneys must be regarded as complications.

Symptomatology.— The symptoms differ as they are the results of a pure or a mixed infection, and as to the anatomical distribution of the pseudomembrane. The mixed type is usually an association of the Klebs-Loeffler bacillus with the streptococcus as in scarlatina.

The general symptoms of any of the forms of diphtheria are dependent upon the degree of toxemia. The attack is usually ushered in with vomiting or a chill. There is no characteristic temperature curve. The fever is of a low grade, 101° to 102° F., in uncomplicated cases. The pulse rate is increased in direct proportion to the youthfulness of the patient. Lassitude or somnolence in various degrees may be observed before local lesions are suspected. The quantity of urine is diminished, and traces of albumin are found in a large proportion of the cases. The blood shows a hyperleukocytosis, especially in the polynuclear elements. The red blood-cells and the hemoglobin are correspondingly diminished.

Diphtheria (Tonsillar and Pharyngeal).— In this type the clinical manifestations vary from those of an extremely mild variety to severe toxic cases. The child may not complain of any sore throat and the membrane may be found only on routine examination. On the other hand, there may be low fever, vomiting, and some difficulty in swallowing. Examination of the throat, which should always be done with the best possible light and with a curved tongue depressor, may show membrane in the form of a grayish-white patch on one or both tonsils. The tonsils may be enlarged and congested. The uvula or adjacent pharynx soon become involved (see Plate XI). A grayer or dirtier colored membrance is seen after the third or fourth day. In severer cases the uvula, posterior pharynx, and fauces show the characteristic membrane. The general symptoms are now more aggravated, due to the toxemia, while prostration is marked. The glands of the neck enlarge and become painful. There is dysphagia and difficulty in enunciation, and there may be delirium. The breath is offensive and quite characteristic, with a pulse rapid and feeble. The temperature is irregular and at times high. If in this form we have the added complication of a mixed infection, the toxemic symptoms are still further aggravated, becoming those of a true sepsis. Complications are then apt to supervene early, and the kidneys almost invariably suffer.

Differential Diagnosis.— Tonsillar diphtheria must often be distinguished from a follicular tonsillitis, especially if the exudation from the crypts has merged, and seemingly forms a membrane. This is especially necessary in the absence of a bacteriological diagnosis. (Plate XI.)

In follicular tonsillitis, both tonsils are usually involved simultaneously. There is an initial high temperature of 104° to 105° F. Usually there is no vomiting. Careful inspection will reveal isolated crypts distended with their cheesy detritus. The pseudomembrane can be readily removed. The diphtheritic membrane, on the other hand, adheres closely and leaves an excoriated and bleeding surface if forcible attempts are made to remove it. The bacteriological diagnosis should be made whenever feasible, but the returns should not be waited for except in extremely mild suspicious cases. The bacteriological examination may be made with a smear preparation stained with Loeffler's solution and directly examined, or by inoculating the tube of blood serum and examining the growth after twenty-four hours of incubation. The precaution should be observed to take the culture before any antiseptics have been applied, or at least within some hours thereafter. Schick has recently perfected a practical test which can be employed to separate the susceptible from the non-susceptible cases. A positive local reaction is obtained when a minute quantity of diphtheria toxin is injected under the skin, if antitoxin is absent, or present only in minute amounts. This reaction appears usually at the end of 24 to 48 hours, persists from 7 to 10 days, leaving a small desquamating surface underneath which the skin remains pigmented. For technic, see article by Park and Zingher, N. Y. Research Laboratory.

Laryngeal Diphtheria.— In this form the membrane may extend from the nose or throat, or it may primarily involve the larynx. In the latter case there are symptoms due to congestion of the mucous membrane of the larynx and the vocal cords; that is, a hoarse inspiratory cough, some restlessness and a low grade of temperature. Cultures, if taken at this stage, are usually found to be negative, especially if a laryngeal swab is not correctly used. As the dis[illegible] ses symptoms of obstruction are apparent, due to the formation of the laryngeal membrane which is sometimes visible about the epiglottis. The cough is more aggravated and paroxysmal in character; the patient acts as if attempting to dislodge an irritating foreign body. There is partial or complete aphonia with a muffled or suppressed cough and whispering voice. The accessory muscles of respiration are brought into requisition. The periods of remission from coughing become shorter and shorter in duration, and are easily brought on by disturbing the patient. If the child falls into a restless sleep, the symptoms are less noticeable, but do not in any sense resemble the normal.

The pause between inspiration and expiration is noticeably prolonged. The supraclavicular, epigastric, and diaphragmatic spaces show marked recession at the height of inspiration. The mucous membranes and nails are cyanosed. Unless relief is now obtained, extreme restlessness sets in, and the child attempts in every way to get air; it is markedly cyanosed, a cold perspiration appears on the forehead, stupor supervenes with spasmodic breathing, apnea, and death.

In certain cases the membrane may extend to the trachea, even beyond the bifurcation of the bronchial tube (see Fig. 67).

The Heart in Diphtheria.— During the course of diphtheria, as well as throughout convalescence, the heart must be most carefully watched. When the local manifestation of the disease is slight and there is no sepsis, the heart may suffer comparatively little. There is a direct ratio between the amount and character of the local inflammatory process and the nature and severity of the constitutional symptoms, especially as regards the heart. In mild diphtheria, a moderately rapid or irregular pulse, without other constitutional symptoms, does not seem to portend the danger that the same action does in severe septic cases. Thus, in mild attacks, an irregular pulse during convalescence may sometimes be improved by letting the child get out of bed. An irregular or intermittent pulse, without symptoms of prostration, cannot have the same significance as when the two coexist. The septic type, with much glandular swelling in the neck, is often fatal from a persistent and powerfully depressant action upon the heart. This organ has here not only to contend with the toxins of diphtheria, but with a general septic poisoning as well, shown by extreme pallor, persistent vomiting and stupor. The occurrence of vomiting in connection with a weak pulse is here an exceedingly grave omen. The vomiting may take place before there are marked evidences of heart failure, but the latter will soon follow. If, in cases where the pulse is acting badly, vomiting begins, the heart will usually prove intractable. A distinct and marked lowering of the pulse rate is sometimes noted in grave cases. This slowing may take place before or after a distinct quickening. The prognosis will depend upon the degree of slowness, which, if extreme, is always followed by a fatal ending. In a case treated by one of us, a boy of five years started with a rapid pulse, which slowed up until it was only 28 for two days before his death. Hypodermic stimulation by strychnin, camphor, caffein and brandy is all that is available in these cases. When the heart is not acting well in diphtheria, the patient must be kept very quiet in the recumbent posture until complete recovery takes place, otherwise sudden death may ensue even during convalescence, especially in septic cases.

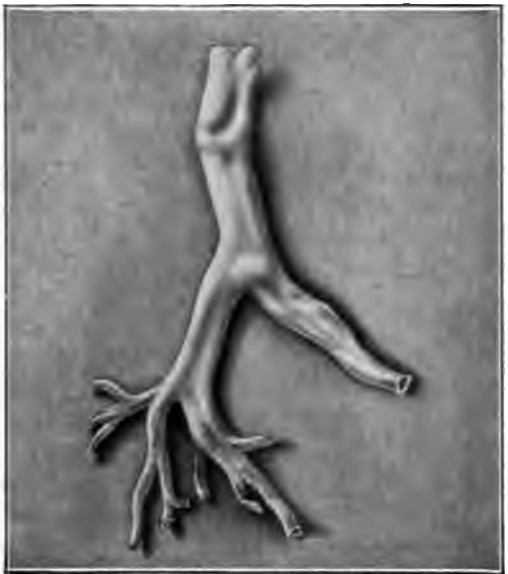


FIG. 67.—Cast of the trachea and bronchi expelled from a case of laryngeal diphtheria.

Differential Diagnosis.—We have abandoned the term croup as applied to diphtheria, as it only tends to misleading conceptions, and perhaps to serious mistakes in management. Clinically, the diagnosis should be based upon the character of the cough, the aphonia, the muffled cry, the progressive signs of laryngeal obstruction, and the recession of the thoracic spaces. In non-diphtheritic laryngitis the child is taken suddenly ill at night with an attack of suffocation and a brassy, barking cough. Ordinary remedial measures, such as steam inhalations and emetics, give speedy relief, with the resumption of normal breathing and apparent health during the next twelve to twenty-four hours, when a second milder attack may supervene. Edema of the lungs, especially when it early complicates a bronchopneumonia, may simulate an attack of laryngeal diphtheria. The physical signs must be depended upon to clear up the diagnosis.

Nasal Diphtheria.— This form is usually seen in children of the school age, and unfortunately the cases are not recognized and isolated as early as they should be. From a clinical standpoint the Schick reaction is particularly useful in the diagnosis of doubtful cases of nasal diphtheria to determine whether they are true cases or simply carriers. The negative reaction excludes clinical diphtheria. Children with nasal diphtheria are undoubtedly great carriers and disseminators of the infection. The disease should be suspected in cases of intractable or aggravated rhinitis in which there is a mucopurulent, blood-tinged discharge, accompanied by evidences of nasal obstruction. The nostrils and upper lip are often excoriated. The children are not sick enough to want to go to bed and may have little or no fever. The use of the nasal speculum will often show the membrane in the nares. It is usually in shreddy patches rather than in firm membranous masses. The glands at the angle of the jaw are moderately enlarged. A culture should be made in all suspicious cases.

If the posterior nares is involved by extension from the pharynx, the prognosis is graver, as it tends to lessen the respiratory ability and the willingness of the child to take food. The toxemia is likewise greater, and the cardiac muscle soon weakens.

Conjunctival Diphtheria.— As in the other forms, this may be primary or secondary to the disease of the nose or throat. The course is extremely rapid. There may be a profuse purulent discharge with marked edema of the eye-lid; the conjunctiva is clouded with a thin membrane of a gray color which adheres closely and bleeds easily if attempts at removal are made.

These local symptoms are accompanied by an increase in the temperature, pulse rate and by somnolence due to the toxemia.

Complications.— The respiratory tract, the nervous system and the heart are the greatest sufferers from the toxemia of diphtheria. Pneumonia is a frequent complication, especially in badly nourished children or in those that have been intubated. The mixed infections predispose to this complication, especially in those under two years of age. Postdiphtheritic paralysis occurs in about one-fifth to one-seventh of all cases. The common form is the local paralysis of the palatal group of muscles coming on early or late in convalescence. The symptoms are regurgitation of liquids through the nose, dysphagia, and dysarthria. The uvula is found relaxed and not supported by its muscles. In the severer forms the physiological action of the pharynx and larynx is disturbed. The muscles of the lower extremities and the eye may be involved in the paralysis. The patellar reflexes are lost, and there may be anesthesia of the lower extremities. Only rarely is there paralysis of the upper extremity as a part of the general paralysis. If the branches of the vagus are involved cardiac irregularity is noticed, and vomiting and pains in the abdomen are complained of by older children. There is a tendency to sudden death in these cases. Nephritis occurs as a result of the toxemia and as it often appears insidiously without puffiness or anasarca, the urine should be carefully watched.

Prognosis.— This must be formed by a consideration of the patient's age, his resistence, the location of the membrane, whether of the pure or of the mixed type, and the time of the serum administration. The following are the mortality statistics from the Boston City Hospital:

(Cases treated with antitoxin.)
Under five years, 20 per cent. of all cases.
Five to ten years, 8 per cent. of all cases.
Ten to fifteen years, 3 per cent. of all cases.

Exclusively nasal cases offer the best prognosis. Uncomplicated tonsillar or pharyngeal cases rank next in a good prognosis. Laryngeal cases are the least favorable, especially when the necessity arises for intubation or tracheotomy. In private practice, where the circumstances are the most favorable, the mortality has been reduced to less than one-third of all cases. Antitoxin has been the means of reducing all the mortality statistics; and if given before the fourth day of the disease the prognosis is very favorably influenced.

Treatment.— The management may be divided into the prophylactic, general, serum, local, and operative treatment.

Prophylactic.— Immunization with antitoxin assumes the first place in prophylactic treatment. The immunity lasts from three to four weeks and, as conclusively proven by the statistics from the New York Board of Health and elsewhere, has saved many lives. Thirteen thousand persons received immunizing injections through the New York Department of Health: of these only three-fourths of 1 per cent. had a subsequent mild grade of diphtheria, and there was only one death. Immunizing doses of 500 to 1,000 units should be given to all the susceptible individuals in a family who have been exposed. In hospitals or institutions patients may be immunized, especially if measles are epidemic. All true cases and suspected cases should be carefully isolated, and disinfection practised as is indicated in the special article on this subject (page 300). (See Shick reaction, page 240.)

General Treatment.— The child should be placed in bed in a well-ventilated, sunlit room, capable of separation from the rest of the house. Cool liquid or semisolid foods, such as milk, ice cream, junket, etc., should be offered at short intervals. Cold compresses are useful to mitigate the dysphagia, while light ice-bladders are often agreeable and efficacious when applied to the neck, particularly in glandular cases. The bowels should be kept open with calomel or salines. The urine should be examined at least bi-weekly. Strychnin sulphate in doses of from 1/240 to 1/100 of a grain, according to the age of the child and the necessity for stimulation, may be given every two to three hours. Whiskey may be alternated with the strychnia in toxemic cases with irregular heart action or bradycardia. Small doses of morphine, 1/40 to 1/16 of a grain, are often efficacious in controlling the restlessness, and at the same time acting as a tonic to the heart. Infusions of normal saline solution have been of material assistance in saving desperate cases. Bromid of sodium, if not contraindicated by the heart's action, is of value as an antispasmodic before extubation in laryngeal cases. Paregoric or Dover's powder in small doses may be given for the same purpose.

Serum Treatment.— Antitoxin should be given in all cases of diphtheria or those suspected of being diphtheritic. In its improved form there are no contraindications to its use. Three thousand units at least should be given in mild cases of faucial or nasal diphtheria, and repeated with a double dose in twenty-four hours if the false membrane has not shown signs of disappearing; 5,000 units may be the initial dose in severer cases. In laryngeal diphtheria 5,000 units in infants and 10,000 units in older children should be given at once. The dose should be repeated in twelve hours in cases of stenosis if the respiratory difficulty is not ameliorated. Double doses must be given if the disease is seen in its later stages. Immunization is satisfactorily accomplished with injections of 500 to 1,000 units, according to the age of the child. In very toxic cases of diphtheria the antitoxin should be injected intravenously in large doses.

The loose tissues under the pectoral region or over the right or left iliac region may be selected for the site of the injection. The skin is made surgically clean, and the antitoxin injected with a large sterile syringe and needle. The wound should be sealed with collodion. The pseudomembrane after the injection of antitoxin slowly tends to detach itself. In laryngeal cases, in which the membrane is not seen, the decreasing symptoms of obstruction give evidences of its good effects. The hypertrophied lymph nodes decrease in size, and the general symptoms are all improved. An eruption in the form of an erythema or urticaria sometimes follows the injection of antitoxin. This is attributable to the horse serum itself. A scarlatiniform or macular rash is occasionally observed. The improved concentrated preparations rarely produce skin manifestations.

Local Treatment.— The curative effect of antitoxin has superseded the use of the strong antiseptics which were formerly locally applied to the membrane. In older children who can gargle, the use of a mild antiseptic solution, such as diluted Dobell's solution, listerine, or a common salt solution, will assist in removing the loosened membrane. Younger children are markedly benefited by irrigations of salt solution, especially in nasal diphtheria (half a dram to the pint), used at a temperature between 100° F. and 115° F. An ordinary fountain bag is used, placed about two feet above the patient's head, who lies on his side, prepared as for intubation (see Fig. 68). A small nozzle is then placed in one of the patient's nostrils and the water allowed to flow, with intermissions to allow for expulsion and breathing. If done in this way, the child soon becomes accustomed to the process and is not frightened, and much relief is obtained. In certain cases the nozzle may be inserted behind the back teeth, and the mouth thus irrigated. If the bag is not placed too high the pressure will not be sufficient to carry infection through the Eustachian tube.

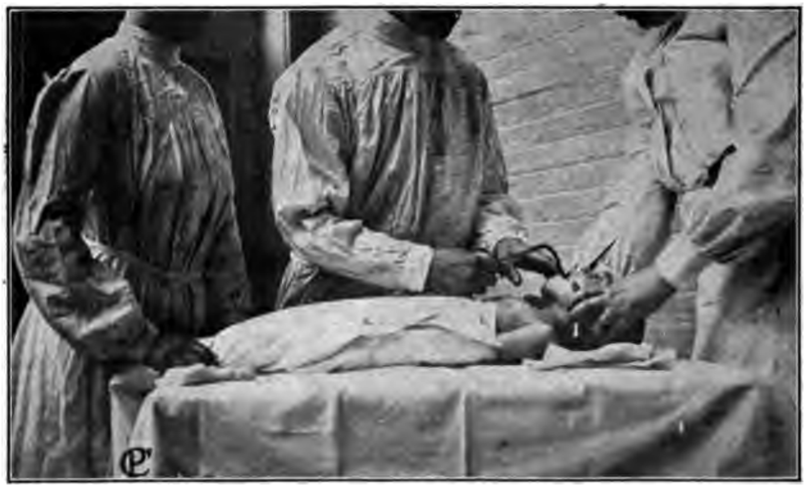


FIG. 68.— Position of the patient in intubation.

An ice-bag applied to the neck in cases of tonsillar diphtheria affords relief and tends to inhibit the growth of the membrane, and to reduce the swollen lymph nodes.

Laryngeal cases are often relieved by swabbing away the collected material at the head of the tube, an ordinary laryngeal applicator being used for this purpose. Diphtheria affecting the conjunctiva must receive as close attention as a case of gonorrheal conjunctivitis besides the injection of large doses of antitoxin.

Intubation.— Intubation, or the relief of laryngeal stenosis by the insertion of a tube, was perfected by Dr. Joseph O'Dwyer, of New York, in 1883. The brilliant results obtained have brought this means of relief into universal favor almost to the exclusion of tracheotomy, which is now rarely practised.

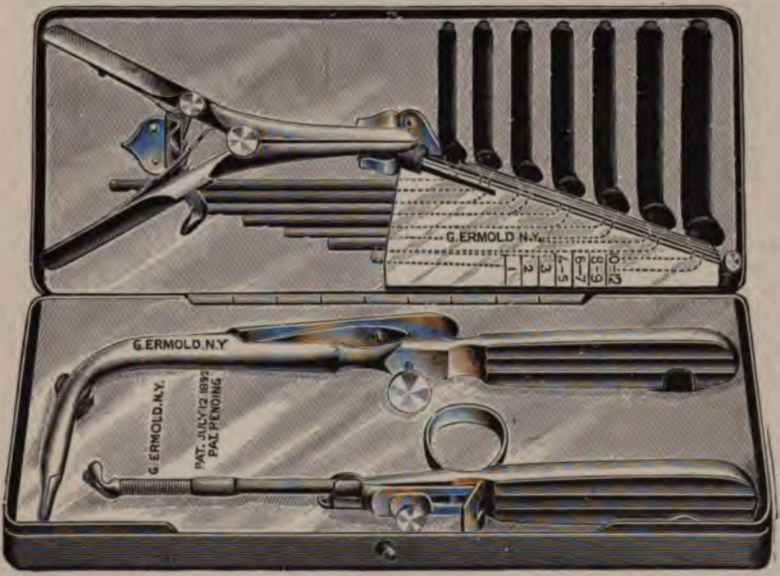


FIG. 69.— O'Dwyer's intubation instruments with detachable parts, in an aseptic case.

The indications for performing intubation are as follows: Intubation should be performed in laryngeal diphtheria when there is marked dyspnea, restlessness, retraction of the epigastric and supraclavicular spaces with evidences of cyanosis.

The child is prepared by being closely wrapped and pinned in a sheet (Fig. 68). The operation may be performed in a horizontal position on a table or in an upright position with the child's head resting against an assistant's shoulder. A second assistant is required to hold the head in the median line and to keep the mouth gag in place, as rapidity and a certain amount of dexterity are necessary. Practice upon the cadaver, and if possible upon the living subject, should be had under the instruction of an experienced operator. The instruments used are generally those of the O'Dwyer pattern, as they conform most accurately to the anatomy of the region. They are now made of hard rubber, metal lined, in sizes according to the age of the child. The neck of the tube is held within the vocal cords, while its lower end extends almost to the bifurcation of the trachea.

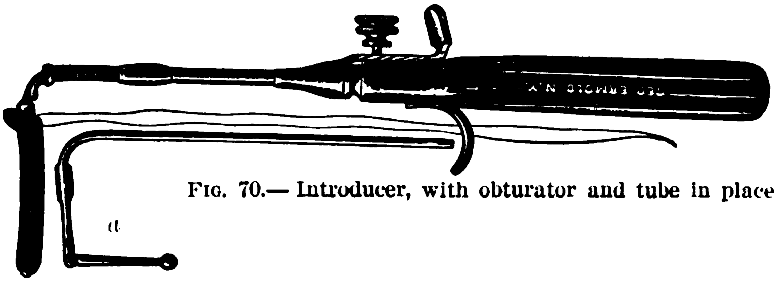


FIG. 70.— Introducer, with obturator and tube in place.

An introducer, an extubator, the tubes, a mouth gag and scale complete the set.

The proper tube having been selected, a loop is made by threading a piece of strong silk through the eyelet placed in one side of its head. The child's head is firmly held and its extremities kept from moving by a second assistant when on a table, or by the knees of the assistant who holds the patient in his lap. The left index-finger is inserted and the epiglottis found and firmly held forward. The palmar surface of the finger should be presented to the tube. At first the handle of the introducer is held parallel to the child's body; it is then raised until the tube passes between the vocal cords, when it will be beyond a right angle to the body of the child. The trigger of the introducer is now used, which allows the body of the tube to pass well beyond the vocal cords, the finger at the head of the tube gently forcing it into place while the obturator is being removed. The

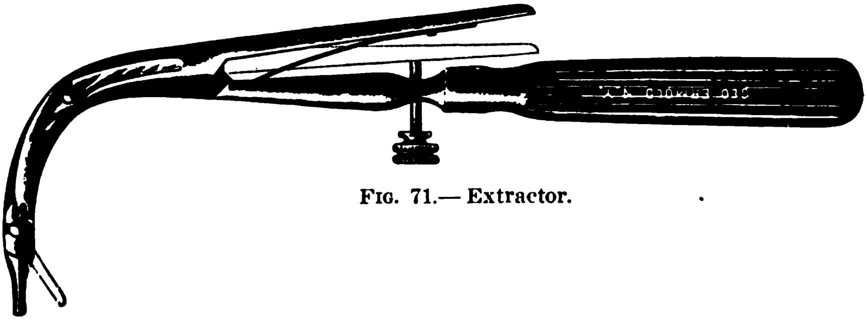


FIG. 71.— Extractor.

cord is still kept in place, but the mouth gag should be quickly removed. A metallic cough and the relief of the symptoms of stenosis will be the proof of success. A series of expulsive efforts, followed by free inspiratory effort, disappearance of cyanosis, and a period of calm and rest for the child, will follow.

Failure may result because the operator has not kept closely to the dorsum of the tongue in passing his tube, or because he has failed to keep the handle of his instrument parallel to the child's body in the first movement toward the epiglottis. In rare instances a certain amount of membrane is pushed down before the tube, and as a result there is no relief, or there may be an increase in the stenotic symptoms. The child should then be held in an inverted position, when the membrane usually is expelled, and the tube may then be reinserted. If any force is used damage may be done. The cord may be removed after some minutes by placing the finger on the head of the tube and withdrawing it, or it may be fastened on the side of the face with adhesive plaster.

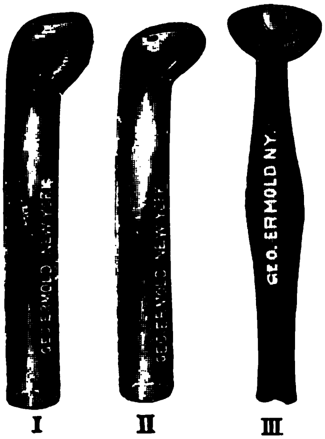


FIG. 72.— Intubation tubes. I. Granulation or built-up tubes; II. ordinary tube (lateral view); III, ordinary tube (front view).

Extubation.— This should be performed as soon as there are evidences of marked improvement in the general condition of the patient as shown by decreased toxic symptoms, and a marked decrease in the laryngeal obstruction. This may occur on the third, fifth, or seventh day, depending upon the severity of the case, upon the early use of the antitoxin, and upon the age of the child. Children under two years of age cannot, as a rule, be extubated as soon as older children.

If cyanosis follows the removal of the tube, it must be quickly replaced, all the preparations having been made for this possibility. Special tubes with built-up heads and retention swells are used in cases demanding prolonged intubation (Fig. 72). They act by preventing and causing destruction of the granulation tissue.

The Feeding of Intubated Cases.— Older children soon manage to take fluids and semifluids without much difficulty. Infants and younger children may be fed in a prone position, or with the head lower than the body, being fed, if necessary, by a bottle or medicine dropper for a few days. Feeding by gavage may occasionally be necessary.

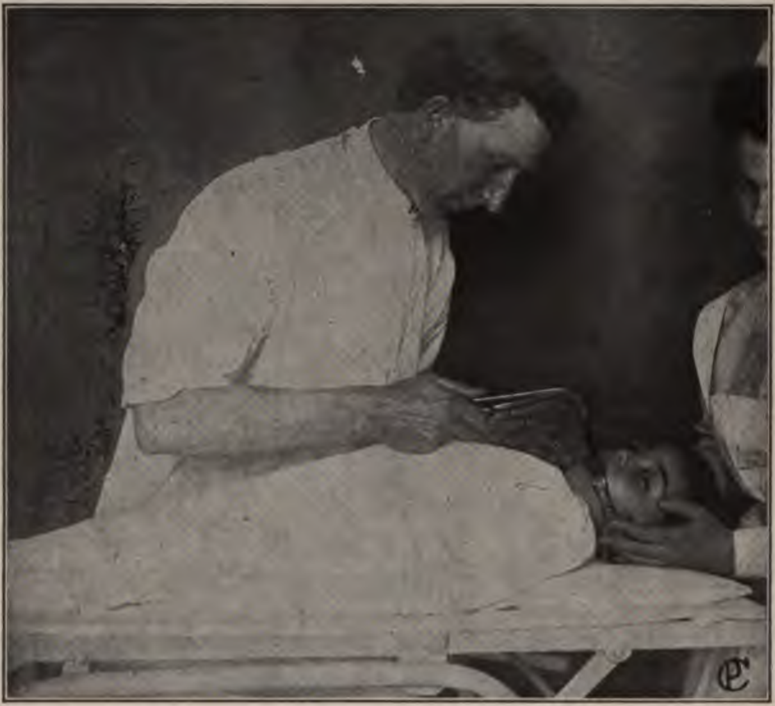


FIG. 73.— Extubation.

Tracheotomy.

Indications for Tracheotomy.— Tracheotomy should be performed in those cases in which intubation has failed and the membranes are forced further down into the larynx; in cases in which the membrane forms below the tube and no relief is obtained; and in cases of edema of the glottis in which there is extensive infiltration.

It may here be mentioned that intubation is far preferable to tracheotomy, and the latter operation should be performed only as a last resort or in those rare cases in which a proper tube is not retained.

The operation should be performed, if possible, under a light general anesthetic. The patient should be prepared as for any aseptic operation if the circumstances allow, the neck being extended over a sand-bag and kept in the median line. An incision one to one and a half inches long is made through the subcutaneous tissue, and then the facia and sternohyoid muscles are separated. The engorged venus plexus is pushed to one side and the trachea exposed. By means of a bistoury an opening is made sufficiently large to admit the cannula. (An instrument which will at once incise and dilate the tracheal wound is now on the market.)

When free respiration is established, the cannula is fastened in place by tapes about the neck, and the wound dressed with moist gauze. A steam atomizer to moisten the respired air is helpful. The attendant should diligently remove the tracheal secretions deposited upon the pledgets of moistened gauze. The inner tube of the cannula should be removed and thoroughly cleansed three or four times a day, or whenever it is obstructed. After the third or fourth day an attempt may be made to permanently remove the cannula. If the patient can get along without the tube, the wound is cleansed, dressed, and allowed to heal.

Pertussis.

(Whooping-cough.)

Pertussis is an acute infectious disease characterized by a paroxysmal cough that consists of repeated expirations ending in an inspiratory whoop, which is often followed by vomiting. Owing to its complications it must be classed as one of the dangerous diseases of early life.

Etiology.— The Bordet-Gengou bacillus is now generally accepted as the specific organism. The secretion is apparently the means of transmission from one individual to another and is very communicable. Clothing and the rooms of the patient do not seem to carry or retain the infective agent. Sporadic cases are constantly seen in large centers, and epidemics frequently occur both in urban and in rural districts. Whooping-cough is no respector of age. It has occurred in the newly-born and in well-advanced adult life. The period of incubation is from seven to fourteen days. The primary stage is probably the time of greatest danger to others.

Pathology.— The larynx and trachea show a marked congestion and exudative inflammation of their mucous membrane. In fatal cases, areas of emphysematous lung are commonly found. Subconjunctival hemorrhages occur in severe cases, and cerebral hemorrhages have been found.

Symptomatology.— For purposes of convenience in description, the disease may be divided into three stages. Namely, the primary (in which the mucous membranes of the nose, larynx and trachea are inflamed), the spasmodic stage, and the period of recession. These, however, merge into each other and are not sharply defined.

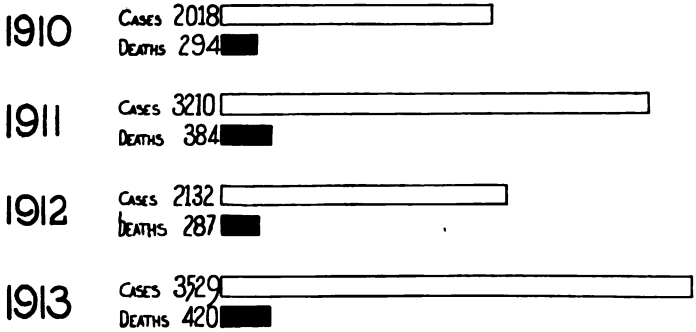
Primary Stage.— The exposed child, after a varying period from two days to two weeks, may have suffused eyes, a rhinitis, and a congestion of the pharynx on examination. The child does not feel sick, but coughs severely, especially at night. The cough is described as having a croupy character. After a few days it becomes more pronounced at night and more frequent in the day time. Physical examination at this time may give no evidences of bronchitis if this is suspected. These negative signs are valuable in leading to the true diagnosis. An increase in the mononuclear leukocytes is quite frequently found at this time. A tongue depressor irritating the pharynx will sometimes produce the characteristic whoop, and thus confirm the diagnosis. A rise of one or two degrees of temperature is sometimes observed, especially when there is an accompanying bronchitis.

Spasmodic Stage.— This is so named because of the paroxysmal cough or whoop which follows the several expiratory efforts. The child realizing the approach of a paroxysm, seeks support from its attendant or clings to some article of furniture. There are three or four violent expiratory efforts, followed by a period of apnea, and then the tremendous inspiratory effort is made which, entering through a partially closed glottis, causes the so-called whoop. During this effort the eyes have become congested, the face almost cyanosed, mucus streams from the nostrils, and a mass of mucopurulent secretion follows the whoop. Vomiting occurs if there is any food in the stomach. Relief now comes to the exhausted patient, and after a brief period of rest, during which there is sweating of the forehead and face, the child goes back to its play. These attacks may occur ten or even a hundred times a day. Naturally, the nutrition soon suffers; the face may later become edematous or puffy, masking the malnutrition of the body. Severe cases may have subconjunctival hemorrhages or bleeding from the nose or lungs. The urine may show traces of albumin and hyalin casts. Convulsions sometimes follow an exceptionally severe paroxysm, especially in infancy. In young infants the spasmodic stage begins very soon after the beginning of t [illegible] " may be absent.

Recession of symptoms is shown by a decrease in the number and severity of the paroxysms, ending in a cough which persists for several weeks.

Complications.— Bronchopneumonia frequently complicates pertussis, especially in infancy. This is the result of an infective process made possible by the abnormal condition of the bronchial tubes and the lowered vital resistance. It generally occurs at the end of the paroxysmal stage. Bronchitis and emphysema are complications more frequently seen in older children. Tuberculosis not infrequently follows in the wake of pertussis. It may be localized (from latent bronchial lymph nodes) or even a general miliary tuberculosis may result. Severe attacks of vomiting reduce the general nutrition and predispose to more important complications. Convulsions result from congestion of the brain, or from minute capillary hemorrhages which may occur during the paroxysm. We have seen hemiplegia follow a severe paroxysm. Hemorrhages into the conjunctiva and hernias in various parts of the body also result from the severe strain imposed by the paroxysms.

Course and Prognosis.— In some cases the disease lasts only a week or two, but on the other hand, we have seen it persist beyond three months. If complications occur it is more apt to be prolonged. The mortality of this disease and its complications is higher than is generally appreciated. Infants, especially, are prone to fatal attacks of pneumonia, convulsions, and tuberculosis. Among the poor, where undernourished children are most likely to be found, the mortality is high.



The prognosis is based upon the general condition of the child, the number and character of the daily paroxysms, and its ability to retain food.

Treatment.— Although whooping-cough, like the other infectious diseases, is self-limited, its severity can be considerably modified and its complications often prevented by appropriate treatment.

Aerotherapy.— The child should spend the greater part of the day out of doors in pleasant weather. If the circumstances permit removal to the seashore it is of undoubted benefit. The fine saline particles thrown up by the surf give quick relief by being inhaled. The sleeping-quarters should also be well ventilated.

Drugs.— For the control of the cough early in the spasmodic stage we have had very satisfactory results with the three following drugs: fluoroform, the bromids, and antipyrin. The treatment may be begun by giving two drops of a 2.8 per cent. solution of fluoroform every two hours during the day to a year-old child. The dose may be increased by two drops for each succeeding year of age. Occasionally this is not effectual enough, or apparently the child becomes accustomed to its sedative action. The bromid of soda in two-grain doses every three hours for a two-year-old child may be substituted. Antipyrin is well tolerated, and can safely be prescribed if complications do not contraindicate. It may also be combined with the bromids as in the prescription given below. A child of six months can be given ½ grain of antipyrin at three-hour intervals, 2 grains to a two-year-old child. If it is used with the bromids the dosage must be regulated accordingly.

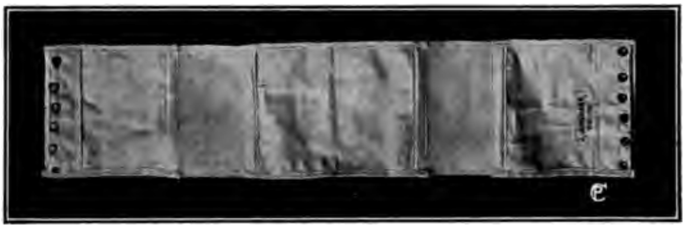


FIG. 74.— The Kilmer belt for pertussis.

In exceptional instances in which the paroxysms are particularly severe and are preventing rest, small doses of heroin, as indicated in the prescription below, will give relief for the night.

For a two-year-old child:

℞ Antipyrini	gr. xxxij
Glycerini	ʒiij
Aquæ	q. s. ad. ℥ij

Misce et signa.— One teaspoonful every three hours for six doses.

℞ Sodii bromidi	gr. xlv
Antipyrini	gr. xxiv
Glycerini	ʒiij
Aquæ	q. s. ad. ℥ij

Misce et signa.— One teaspoonful every three hours for a three-year-old child — well diluted.

℞ Heroini hydrochloridi .... gr. ⅛
Antipyrini .... gr. xvj
Elixiris adjuvantis .... ℥ij
Misce et signa.— A teaspoonful every three hours to a child of two years for three doses.

Vaccine Treatment.— A study of the literature, coupled with our own experience, make it impossible to advocate this form of treatment in pertussis.

Diet.— Food should be taken in smaller quantities and at lessened intervals than in health. This measure in itself prevents the vomiting which readily occurs when a full meal is taken. After vomiting, a cup of milk or meat broth may be immediately given. Only simple, light and nutritious articles should be permitted in the dietary.

The inhalation of antiseptics has given us no satisfactory results. In fact, it tends to encourage poor ventilation in the sleeping apartment. A belt as suggested by Kilmer can be worn if vomiting is frequent. In a certain number of cases this appliance (see Fig. 74) has given relief from this distressing symptom.

Mumps.

(*Epidemic Parotitis.*)

Mumps is an acute communicable disease of the salivary glands, characterized by a swelling of the parotid gland and the neighboring salivary glands, and at times involving the testis or ovary.

Etiology.— Children from two to fifteen years of age are most often affected. Epidemics are common in schools and institutions. The specific contagium has not been isolated. Close contact is necessary for its dissemination, but the disease is transmissible before the swelling appears. The portal of entry seems to be the buccal cavity. The period of incubation is an indeterminate one; it ranges from one to four weeks. Immunity is generally conferred by the one attack. Recurrences, however, do occur.

Pathology.— According to Virchow, there is an inflammatory, serous and cellular infiltration of the intraacinous and periacinous connective tissue, which tends to resolution without induration.

Symptomatology.— In children the onset is usually mild, with a period of malaise, drowsiness, fever of one or two degrees (only rarely 104° F.), chilliness, and sometimes vomiting. A swelling now appears below the lobe of the ear on one side of the face and in a few days the opposite gland is generally involved. The child complains of a feeling of fullness, with pain localized in the angle of the jaw. The swellings are elastic on palpation. Mastication is difficult and food may be refused for this cause. The fever ranges from 101° to 103° F. Occasionally there is earache or deafness. The swelling may extend over the parotid in front, or involve the submaxillary gland and the neighboring lymph nodes, giving the characteristic rounded appearance. The displacement of the auricular lobule with the lobe of the ear in the center of the swelling assists in fixing the diagnosis.

In some instances there is little or no discomfort, and the child is not willing to go to bed. After seven or ten days the swelling subsides and entirely disappears. Relapses, however, may occur. Occasionally the swelling is very large and painful. In exceptional instances only, the submaxillary glands may alone be involved.

Lymphocytosis is quite a constant accompaniment, especially at puberty (Wile).

Complications.— In boys orchitis is occasionally seen, and the same may be said of ovarian pain in girls. The breasts especially in girls may be tender. When these complications do occur, the child is generally at or near the age of puberty. The lymph nodes may become secondarily involved, and suppuration of the affected glands take place, but only if there has been a mixed infection. Deafness, inflammatory eye diseases and rarely nephritis are complications which may occur, and should be guarded against.

Differential Diagnosis.— Mumps should not be confounded with hypertrophied lymph nodes which present an irregular nodular swelling and are not found on the face. An examination of the throat or a concomitant infectious disease may account for such a swelling. Involvement of the submaxillary glands alone, so-called submaxillary mumps, must, however, be considered. If with a history of exposure there is a large soft swelling filling up the space between the angle of the jaw and the mastoid process, and it lifts forward the lobe of the ear, the diagnosis is quite certain.

Prognosis.— In this benign disease, which is rarely complicated, fatalities do not occur, and the prognosis is most favorable. Deafness sometimes results and rarely following an orchitis the testicle ceases to develop.

Treatment.— As it is a communicable disease, the children should be isolated. If there is fever and discomfort, a laxative is given, and the child is put to bed. Local anodyne applications of 3 per cent. ichthyol-lanolin ointment, or warm oil of hyoscyamus are applied. Often a hot-water bag is found to be very agreeable. Mouth-washes of listerin or boric acid solution should be used frequently. The bowels should be kept freely opened, and a liquid or soft diet ordered. Guaiacol ointment (5 to 10 per cent.) is soothing if orchitis is present as a complication. The patient may mingle with other children after [illegible]eek.

The question often arises, when may a child who suffered from a recent infection return to school or mingle with other children? The following suggestive table may here be of service:

DISEASE.	After an Attack a Pupil May Not Return to School Until	If Other Children Are at Once Removed from House They May Return to School	If Other Children Remain in House They May not Return to School Until
Scarlet Fever	After 6 weeks from inception of disease, provided desquamation is complete and no aural discharge is present.	14 days after thorough disinfection and entire change of clothing.	10 days after certificate by Board of Health.
Diphtheria	After 3 negative throat cultures taken on different days.	7 days after immunization and 3 negative cultures.	1 week after certificate from Board of Health after immunizing.
Measles	3 weeks after appearance of rash and until all symptoms have disappeared.	3 weeks after last exposure.	10 days after certificate from Board of Health.
German Measles	3 weeks after appearance of rash and until all symptoms have disappeared.	After 2 weeks.	2 weeks after certificate from Board of Health.
Chicken Pox	After complete healing of all scars.	18 days after last exposure.	1 week after last case has been thoroughly healed and disinfected.
Mumps	1 week after the swelling has entirely subsided.	After 3 weeks from inception of primary case.	2 weeks after subsidence of last case.
Whooping Cough	3 weeks after last characteristic cough.	18 days after last exposure if no cough	18 days after all cough has ceased in the last case.
Conjunctivitis	7 days after all inflammation has disappeared and a negative smear is obtained.	After use of disinfecting eye drops.	After use of disinfecting eye drops.
Colds, with nasal discharge	All symptoms of discharge have ceased.		In case of influenzal attack disinfect premises before returning to school.

Typhoid Fever.

Etiology.— Typhoid fever is a specific infectious disease due to the typhoid bacillus. Infected drinking-water, infected milk, and contact with attendants who may be typhoid bacilli carriers are in greater part responsible for the infection in children. Irresponsible children are liable to drink contaminated water in any place, and especially when going about at summer resorts. Infants and young children are more liable to infection when they are placed close to the ground or are handled and fondled by many adults. Dishes, thermometers, or flies may carry the infective agent. The fall of the year, when the children return from the country, always shows the greatest number of cases. The disease is by no means as rare in infants and children as was formerly supposed. The Widal reaction has revised the figures. About 6 per cent. of the cases occur under two years, and 8 per cent. under five years, and 46 per cent. between five and fifteen years. Typhoid fever may be transmitted from the mother to the fetus.

Pathology.— As differentiated from the pathology of the disease in adults, we have a milder ulceration of the solitary follicles and Peyer's patches: and when examined postmortem, it is often difficult to distinguish the ulceration from a case of ileocolitis. In infants there may be no ulceration whatever. In older children, especially where healing has taken place, the "shaven beard" appearance is sometimes seen due to pigmentation. The ulceration rarely penetrates beyond the submucosa. This pathologic picture is in distinct relation to the milder character of the symptoms as met with in children. The mesenteric lymph nodes in the ileocecal region are enlarged. The spleen may be enlarged, congested, and soft. The mucous membrane of the bronchi and larynx are often involved in varying grades of inflammation. The kidneys quite regularly show cloudy swelling. The heart muscle shows mild grades of myocardial degeneration.

Symptomatology.— The prodromal symptoms are so irregular and so apt to be influenced by some one prominent symptom or symptom-complex as to lead the examiner astray.

In infants the mode of onset is quite different from that of older children. The infant has an initial high fever which becomes irregular or remittent, and subsequently the symptoms resemble a gastroenteric infection. Convulsions are the exception. Older children who are able to describe their symptoms complain of headache and chilliness. Malaise and vomiting are frequently observed, while delirium at night, when the fever is high, is seen after a few days. Epistaxis is the exception. Cerebral symptoms may usher in the disease. A cough is often present quite early and serves to obscure the diagnosis. A careful physical examination of the chest by a process of exclusion may point the way to an early diagnosis. It will be well to take up the symptoms seriatim to give a picture of the varied manifestations of the disease, and these will be described in the order of their early assistance in diagnosis.

Roseola.— These spots, which are macules fading on pressure and distinctly discrete, are observed in more than 60 per cent. of the cases. The eruption is seen as early as the fourth or fifth day, and, as a rule, is widely scattered. The abdomen, chest, and back may each show them. We have seen hemorrhagic areas on the abdomen, toes, and heels in severe or fatal cases.

Spleen.— As a rule, the younger the child the less often is the enlargement felt early. It is distinctly palpable in the second week. The splenic enlargement often persists after convalescence has begun. There may be a relapse without an enlargement of the spleen, or the spleen may not be felt throughout the course.

Mouth.— The rather characteristic tongue seen in adults is rarely observed in children, and it clears up much more rapidly. Sordes on the lips are common.

The Stools.— These are not necessarily of the pea-soup variety; in fact, moderate constipation more often persists throughout the disease.

The Temperature.— The temperature curve is only rarely typical. During the first week there is a gradual rise in temperature until the maximum point is reached. The fever now assumes a remittent type, but it is not unusual to have intermissions. Cases with cerebral symptoms may have a hyperpyrexia for days.

The temperature curve may last from two to six weeks; occasionally in protracted cases there is a gradual daily rise; but we feel that this fever may be solely due to the asthenia caused by a low diet. Complications such as bronchitis, pneumonia, otitis, or even constipation may influence the course of the pyrexia causing irregularities in the curve. Relapses produce a low-grade temperature after a period of normal or almost normal temperature.

Laboratory Tests.— An early test and one which often gives results during the first week is the use of blood cultures made from freshly drawn blood. The Widal reaction (see p. 56) is present in 95 per cent. of typhoid patients, and may be obtained as early as the end of the first week.

The urine and feces contain the bacilli, and improved laboratory methods show their presence in 20 to 50 per cent. of the cases. The Ehrlich-Diazo reaction is sometimes present before the Widal reaction, and when obtained is confirmatory evidence of the disease, but not pathognomic.

The Blood.— The red blood-cells and the hemoglobin diminish as the disease progresses, but the leukocytes are quite uniformly low from the beginning. With the establishment of convalescence, the differential count shows an increase in the eosinophiles and mononuclear lymphocytes and a corresponding decrease in the polynuclear neutrophiles.

Pulse.— The relatively slow pulse is obtained only in older children, from ten to fifteen years. Infants and young children not uncommonly have a pulse rate as high as 150. Irregularity is quite frequently noted, while the dicrotic pulse is rare.

Pain.— It is seldom that this symptom is elicited in young subjects. In older children it is present in the ileocecal region in a good number of cases, and usually is accompanied by tympanites and probably is a result of ulcerative processes in the agminate glands or Peyer's patches.

Hemorrhages.— It is rare to have hemorrhages in children. When they occur the amount is usually small and more easily controlled.

The Heart.— Depending upon the amount of toxemia we have myocardial changes which may produce systolic murmurs and cardiac irregularities.

Treatment. Prophylactic.— If children live in vicinities having a suspected water supply, or remove to such a locality, precautions should be taken to boil the water and to supply an absolutely clean, uncontaminated milk. The excreta of the attendants should be examined for the possibility of the presence of the bacilli if there has been a history of previous typhoid. Weaning or a wet-nurse is indicated if the mother herself is infected.

Typhoid precautions should be scrupulously observed even in suspected cases, the feces, urine, and clothing being disinfected with carbolic acid or chlorinated lime (as given on page 301). The napkins of infants should be made of cheap material and destroyed by burning. Dishes and other washable articles should be sterilized by boiling.

Acquired Immunity.— Further experimentation has established the value of typhoid immunization incorrectly spoken of as typhoid vaccination, and children may be thus protected, especially if they are to live or travel in a section having typhoid outbreaks or poor sanitary laws.

Dosage for Typhoid Immunity.— For adults 500,000,000 bacilli are advised for the first dose and one billion for the second and third doses. For children the dosage may be gauged according to body weight; thus a child of 50 pounds will require one-half that of the adult. It is best given in the upper arm and the subsequent two doses given at ten-day intervals.

General Treatment.— Careful, capable nursing far exceeds the value of drugs in this disease. A well-kept chart recording the variations in temperature, pulse, and respirations, every three or four hours, with notes upon the character of the pulse and stools, is of great importance to the physician.

The room should be as large as possible and one that can be well aired, and in which quiet can be maintained. Two beds so as to allow ready change of linen and position are preferable. Scrupulous attention should be paid to the mouth, tongue, and teeth, keeping them as free as possible from foreign material by the use of swabs dipped in mild antiseptic solutions, such as listerin or boracic acid. For disinfection of excreta, see Disinfection (p. 300).

Feeding.— In mild cases in which the temperature is not high, and the digestive processes have been little interfered with, milk and lime-water, thin gruels, plain or dextrinized, broths made of mutton or chicken, orangeade, and lemonade, form a list which will not be tiresome and which furthermore will fairly well keep up the patient's nutrition until he is able to take semisolid food in the beginning of convalescence.

Severe cases with continued high temperature may require the peptonization of the milk or the discontinuance of milk entirely, if it causes tympanites. Dextrinized gruels, beef broths, and albumin water may be substituted.

In convalescence, in addition to articles already permitted, zweiback dipped in broths, milk toast, junket, scraped beef, baked custards, and soft-boiled eggs are cautiously added to the diet. Matzoon and kumyss or home-prepared buttermilk are occasionally relished by the child and vary the monotony of his restricted dietary. In 11 consecutive cases in our hospital, 7 gained in weight, 3 lost slightly and 1 showed a considerable loss on the regular soft diet.

Hydrotherapy.— The fever is in nearly all cases effectively controlled by sponging with alcohol and tepid water. We have discontinued the use of tubbing. Any good effects of the reduction of temperature obtained are more than counterbalanced by the nervous excitement it produces. Therefore, a wet pack is preferable for high temperatures not controlled by sponging, the sheets being wrung out in water at 90° F. If at this temperature a satisfactory reduction is not obtained, the wrappings may be sprinkled with water at 85° or even 80° F. An ice-bag may be applied to the head, especially if there is headache or delirium, but it requires constant vigilance on the part of the nurse who should be instructed to remove it if any cyanosis develops.

Drugs.— With the exception of certain symptoms which will require control by the use of medication, no drugs should be given. Intestinal antiseptics and alcohol as routine measures are to be deprecated. The bowels are kept open with saline enemas which may be given cool if the temperature is high. Divided doses of calomel are indicated in the beginning of the disease. Tympanites should be prevented rather than treated by careful supervision of offending articles of diet, especially the milk. Headache and restlessness if not sufficiently allayed by the hydrotherapeutic measures can be subdued by the use of the bromides. Alcohol is given in the form of sherry wine or whiskey if the pulse is weak or the reaction is not good following a pack. Strychnia, grains 1/200, tincture of digitalis or strophanthus, in two-minum doses, or brandy hypodermatically are given if collapse threatens. If hemorrhage occurs, a light ice bag or coil is immediately applied to the abdomen and Dover's powder in maximum doses given. The treatment for perforation, which would be evidenced by sudden pain, abdominal tenderness, and changes in the rational signs, demands prompt surgical intervention.

Influenza.

(*Acute Catarrhal Fever. La Grippe.*)

Definition.— An acute, specific, infectious disease affecting the respiratory or gastrointestinal tracts, and usually associated with marked prostration.

Etiology.— While the disease is endemic, especially in damp, cold weather, it is very frequently seen in epidemic form. The immediate cause is a small bacillus first isolated by Pfeiffer in 1892. The bacillus may be localized in the mucous membrane of the nose, throat, or lungs. Other pyogenic bacteria may be present with the influenza bacillus, thus giving a mixed infection. Pfeiffer's bacillus resembles a diplococcus, having rounded extremities and staining markedly at the ends.

Incubation.— From twelve hours to three days.

Pathology.— There is some inflammation in nearly all the mucous membranes. In addition to this, complicating inflammations may exist in the heart, lungs, middle ear, mastoid process, kidneys, and gastrointestinal tracts. Meningitis occurs, though not commonly, which can be proven by examination of the cerebrospinal fluid to be caused by the influenza bacillus. Tuberculosis may also follow an attack of influenza. A marked general depression often accompanying influenza is doubtless caused by the toxins secreted by Pfeiffer's bacillus.

Symptomatology.— Although young infants are not particularly susceptible in contracting the disease, yet when they are attacked it is apt to assume a grave form with high temperature and great prostration. The younger the child, the more severe is usually the infection. In older children the average clinical description of symptoms as affecting principally either the respiratory, digestive, or nervous systems will hold good. It is true, however, that these varying symptoms will often be found combined in a given case.

Inflammatory disturbances of the respiratory tract predominate in children. There is marked coryza with an acrid discharge that may excoriate the upper lip. A general pharyngitis is also present, the mucous membrane presenting a thickened, spongy appearance. The tonsils may be swollen and show white points of exudation in the crypts. In a word, there is a severe general rhinopharyngitis present that is prone to involve the Eustachian tubes and middle ear, with a secondary enlargement of the lymph notes that are connected with this region under the ear and back of the jaw.

These disturbances are evidently more virulent than the ordinary inflammation met with in this region. This is not only seen locally, but in the disposition of the process to extend downward. In some ways this is analogous to the course of measles. The larynx, trachea, and bronchi are quickly involved, but in many cases the inflammation does not extend below the larger or medium-sized tubes. The cough may assume a paroxysmal character simulating pertussis. In others there is involvment of the small tubes and alveoli coming on soon after the onset of the disease. This type of bronchopneumonia is much like the ordinary form so far as physical signs are concerned, but early prostration is more marked and the temperature is usually irregular and higher than the local lesion would seem to warrant. True lobar pneumonia is also not infrequently seen, and, as in most influenza conditions, exhibits disturbances of temperature and circulatory and nervous depression out of proportion to what would be expected from the pulmonary signs. Perhaps the most frequent exhibition of pneumonia is seen in the form of irregular patches with sneaking invasion, when it is very difficult to decide the exact nature of the pneumonic process.

Various grades of pleurisy are frequent accompaniments of pneumonia, and empyema may be the terminal condition. This must be constantly borne in mind as this empyema is even more insidious than usual, especially in infants.

In cases where the gastrointestinal symptoms predominate there may be severe vomiting and the passage of loose, undigested stools. Nourishment is badly taken and after an interval the stools may contain mucus and even blood. The gastroenteric symptoms may appear at the very beginning of the attack, or later during the course of the disease. While under proper dietetic and medicinal treatment these symptoms may not last beyond a few days, they naturally add to the prostration, and in young and feeble infants may predispose to a fatal ending.

The cases in which pure nervous disturbances preponderate over the inflammatory symptoms do not seem to be so common in early life. Some severe cases may start with convulsions and simulate meningitis with photophobia, stupor, and, in older children, headache and delirium. In uncomplicated cases, however, these marked nervous disturbances do not last longer than a few days. True cerebral meningitis may be caused by the influenza bacillus. We have seen a number of cases which clinically resembled cerebrospinal meningitis. The fluid from these did not show the presence of meningococcus or pneumococcus. In such cases closer study should be made of the fluid for the bacillus of Pfeiffer.

Some of the clinical phenomena, aside from the types just mentioned, may be noted. The fever is apt to be irregular and at times very high, especially in young infants. In some cases, fever and prostration will be the principal symptoms of the disease with little evidence of any local inflammation. In other cases, an irregular fever may last for several weeks and simulate typhoid fever. Here all the modern diagnostic methods must be employed in order to make a proper diagnosis. A further confusion will be caused by intestinal and diarrheal symptoms sometimes accompanying these prolonged cases. Some of the protracted cases are quickly relieved by change of air, particularly to a location where influenza is not so prevalent.

The skin is sometimes involved, with various forms of erythema. This may at times simulate measles or appear in scarlet form. The irregular character and distribution of the eruption, with entire absence of desquamation, and existing in connection with the various symptoms of influenza will throw light on its character.

The urine will frequently show traces of albumin in influenza. It is probable that this has no great significance. Cases have been reported in which acute nephritis has supervened. Rachford states that if nephritis exists as part of the influenza attack the worse symptoms occur early, and that if the life of the child is not destroyed within the first week of the

disease, a sure and steady improvement begins which leads to complete recovery.

Diagnosis.— In diagnosticating this disease, the bacteriological aid is not so great in practice as it is in theory. The bacilli are difficult to discover, and frequently disappear early in the disease. Not only are they very hard to find in smear, but their culture requires a blood serum which may be difficult to procure. Accordingly, in the great majority of cases, the physician must depend entirely on clinical signs for a diagnosis. In some cases he has to rely largely on a process of exclusion. Wherever an illness quickly shows a prostration out of proportion to the apparent lesions, influenza may be suspected. The tendency to spread through a family is suspicious, as the disease is highly contagious. This will be helpful in children, as adults usually contract the disease first, and the physician being informed of this will be helped in making his diagnosis. There are nearly always inflammatory symptoms in the nose and throat to help the diagnosis. The onset of acute tonsilitis or pneumonia will often cause confusion. The former usually has a higher temperature and a more abrupt onset, while the latter should show physical signs early in the attack. A central pneumonia, however, may require several days for a differentiation from influenza where both are suspected. In some cases, the course of the disease, with presence or absence of local lesions, will be all that will clear up the diagnosis.

When influenza is epidemic probably other conditions are oftener explained wrongly as due to this cause than *vice versa*. At any rate, a knowledge of its prevalence will put the physician constantly on guard in examining and diagnosticating obscure symptoms accompanied by prostration.

Treatment.— The first requirement is isolation of the patient as far as possible, to prevent the disease spreading through the family. The room should be well ventilated with plenty of fresh air, as this not only supports the patient, but tends to prevent reinfection as well as the direct spread of the infection to others. Close, badly ventilated rooms often seem to hold the infection for a long time. The child should be kept quietly in bed, even in mild cases, and simple, easily-digested nourishment given. When the fever is high, reliance should be placed rather on frequent spongings with cool or tepid water and alcohol than on the coal-tar derivatives. If there is much restlessness with the fever, small doses (one or two grains) of phenacetin with citrate of caffein may be given for a few doses at least. Where pain is evident, sulphate of codein, gr. 1/30 to gr. 1/20, for an infant of one year may be administered. For support and stimulation, sulphate of strychnin is most valuable, gr. 1/400 to gr. 1/300 every three or four

In cases where the gastrointestinal symptoms predominate there may be severe vomiting and the passage of loose, undigested stools. Nourishment is badly taken and after an interval the stools may contain mucus and even blood. The gastroenteric symptoms may appear at the very beginning of the attack, or later during the course of the disease. While under proper dietetic and medicinal treatment these symptoms may not last beyond a few days, they naturally add to the prostration, and in young and feeble infants may predispose to a fatal ending.

The cases in which pure nervous disturbances preponderate over the inflammatory symptoms do not seem to be so common in early life. Some severe cases may start with convulsions and simulate meningitis with photophobia, stupor, and, in older children, headache and delirium. In uncomplicated cases, however, these marked nervous disturbances do not last longer than a few days. True cerebral meningitis may be caused by the influenza bacillus. We have seen a number of cases which clinically resembled cerebrospinal meningitis. The fluid from these did not show the presence of meningococcus or pneumococcus. In such cases closer study should be made of the fluid for the bacillus of Pfeiffer.

Some of the clinical phenomena, aside from the types just mentioned, may be noted. The fever is apt to be irregular and at times very high, especially in young infants. In some cases, fever and prostration will be the principal symptoms of the disease with little evidence of any local inflammation. In other cases, an irregular fever may last for several weeks and simulate typhoid fever. Here all the modern diagnostic methods must be employed in order to make a proper diagnosis. A further confusion will be caused by intestinal and diarrheal symptoms sometimes accompanying these prolonged cases. Some of the protracted cases are quickly relieved by change of air, particularly to a location where influenza is not so prevalent.

The skin is sometimes involved, with various forms of erythema. This may at times simulate measles or appear in scarlet form. The irregular character and distribution of the eruption, with entire absence of desquamation, and existing in connection with the various symptoms of influenza will throw light on its character.

The urine will frequently show traces of albumin in influenza. It is probable that this has no great significance. Cases have been reported in which acute nephritis has supervened. Rachford states that if nephritis exists as part of the influenza attack the worse symptoms occur early, and that if the life of the child is not destroyed within the first week of the

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disease, a sure and steady improvement begins which leads to complete recovery.

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Influenzal Meningitis.— In influenzal meningitis the fluid is quite uniformly cloudy, with a well-marked straw-colored sediment. In those instances in which a clear fluid has been reported the presumption must be that not enough fluid was abstracted to have drained the subdural spaces. The fluid abounds in polymorphonuclear leukocytes while the bacilli are found to be both intra- and extra-cellular, and do not differ morphologically from those obtained from other structures of the patient.

Aside from making the diagnosis the practical feature is the treatment. Heretofore we have treated this type of meningitis as we would a pneumococcic, or in fact any meningeal inflammation with signs of intra-cranial pressure — namely by supportive measures and repeated lumbar punctures. The rapidity of the course in this type hardly allows us to await results with medication directed toward the invading organism, so that such a drug as hexamethylenamin (urotropin), for example, is of little avail.

Wollstein in her valuable contribution to this subject has shown the curative possibilities of an immunized serum made from a virulent influenza organism. She calls attention to the need of making the diagnosis by puncture promptly, and the necessity of resorting to the serum treatment immediately after the diagnosis is confirmed. The mode of use is that recommended for Flexner's serum.

Syphilis.

Definition.— Syphilis is a communicable disease that may be acquired by inheritance or by direct contact after birth. In the latter case there is always an initial lesion, the chancre, followed by numerous secondary lesions, affecting principally the skin and mucous membranes, and by tertiary symptoms involving the bones, viscera, and the organs of the special senses. In hereditary syphilis there is an absence of the initial lesion and the disease shows itself in the secondary form from the beginning.

Hereditary or Congenital Syphilis.

Definition.— This is a form of the disease in which the infection is primarily derived from the father or mother.

Method of Transmission.— Our knowledge of the transmission of this disease has recently been greatly increased by means of the Wassermann reaction. It seems probable that the mothers of all children having congenital syphilis are themselves syphilitic. Knoepfelmacher in a study of forty-five cases found that 56.2 per cent. gave a distinctly positive Wassermann reaction. More than half of these cases never gave any symptoms of, nor were ever treated for syphilis. The mothers of children having syphilis give as high a percentage of positive Wassermann reactions as do men who have reached the latent stage of syphilis.

A positive Wassermann reaction in the mother lessens the possibility of the child being born sound. A mother may during a period of latency or of vigorous treatment give birth to a sound child, even though she at some later time again develops active symptoms. When the mother is suffering from acute syphilis it is transmitted in an active form to the child. The degree of such transmission depends upon the stage and severity of the disease and the nature of the treatment employed.

The apparent immunity of the mother in fact does not exist, for if she bear a syphilitic child she herself is syphilitic. Coles' dictum, therefore, that "a new-born child affected with inherited syphilis, even though it may have symptoms in the mouth, never causes ulcerations of the breast which it suckles, if it be the mother who suckles it, although continuing capable of infecting a strange nurse" has been practically proven to be a fallacy. Profeta's law is likewise in error, for every child born of a syphilitic mother, no matter how healthy in appearance, is syphilitic if the mother shows any active symptoms of the disease.

It is now almost a certainty that syphilis is never transmitted through the spermatozoa of the male. The disease is transmitted from father to child through the mother. A positive Wassermann reaction is obtained much less often in the father than in the mother, this probably being due to the fact that syphilis is in a majority of cases a self-limiting disease, the dangers of transmission after the fourth or fifth year being greatly diminished.

Pathology.— The spirocheta is widely distributed in the infant's body. According to Trinchese, they are found most abundantly in the suprarenals, then in the liver, lungs, ovaries, testes, spleen, the fetal end of the funis, and also with relative frequency in the blood. They are relatively rare in the placenta, but may be found in the stroma and on the surface of the villi. The migration of the spirocheta from the vessels of the villi to the surface of the villi and into the intervillious spaces is regarded by Trinchese as normal.

The spirocheta can, as a rule, be easily demonstrated in any of the superficial ulcerating areas by the "india-ink method" of Hech and Wilenko. A small drop of serum is pressed out of the tissues and placed upon a slide. To this is added a similar sized drop of india ink (Gunther's and Higgin's) and thoroughly mixed with a platinum loop. The mixture of serum and ink is allowed to dry, after being spread out as thinly as possible. This smear is then examined under an oil-immersion lens.

The fetus may die at any time during the uterogestation with resulting miscarriages, or may live to term and then be still-born. When born alive, the lesions resulting from the disease may be broadly divided into those involving the skin and mucous membranes, the viscera, and the bones. There may be erythema, maculo-papules, or papules on the skin, or a vesicular and pustular eruption may occasionally be seen. Blebs or bullæ often appear at birth in a severe type of the disease. Crops of boils, with well-defined, coppery-red bases, are apt to be symmetrically arranged when many are present, or asymmetrically distributed if only a few are seen. The lesions of the mucous membranes may take the form of inflammatory processes, of mucous patches, or of superfical or deep ulcerations. The junction of skin and mucous membrane is a favorite seat for the syphilitic lesion. The viscera are more apt to be involved in hereditary than in acquired syphilis, the lesion taking the form of an interstitial hyperplasia. The growth of interstitial connective tissue, which, by gradual contraction, partially obliterates the parenchyma of the organ, may involve the lungs, spleen, liver, pancreas, and testicle. Usually a portion of a lobe, but occasionally a whole lobe of the lung, may present a diffuse fibroid infiltration with a grayish-white color. The liver, which is not infrequently affected, is hardened and enlarged from a diffused sclerosis, although occasionally the affection may be circumscribed. Gummata, in the form of small, circumscribed nodules, may be found in the lung, liver, or other viscera. Bone lesions are quite common and some that were formerly referred to rickets or scrofula are now recognized as syphilitic. There are two principal ways in which the specific poison affects the bones in early life. In one instant the brunt of the disease and morbid change takes place at the junction of the shaft with the epiphysis — osteochondritis: in the other, the periosteum covering the long bones is principally affected with a resulting periostitis. Both of these varieties involve principally the long bones. Osteochrondritis develops early in life, usually within the first month. It may, however, occur later, when it is not apt to become multiple, and may be unsymmetrical in distribution. While epiphyseal swellings may be due to rickets as well as syphilis, such swellings are pretty surely syphilitic if they occur during the first six months of life and they are relieved by mercurial treatment. Again, the epiphyseal swellings of rickets are always symmetrical, while those of syphilis may be unilateral. Periostitis occurs later in hereditary syphilis, usually after the child has begun to walk. It attacks by preference the femur, tibia, and bones of the forearm, occurring usually from the second to the fourth or fifth year. At an early stage of the disease the bones are attacked symmetrically, but later, circumscribed nodes may be placed unilaterally.

A dactylitis attacking by preference the proximal phalanges of the metacarpal and metatarsal bones, enlarging them to several times their natural size, may occur. There is not much destruction of bone but after a time the skin may become inflamed and break down from the formation of an abscess. Craniotabes may result from the malnutrition of syphilis as well as from rickets.

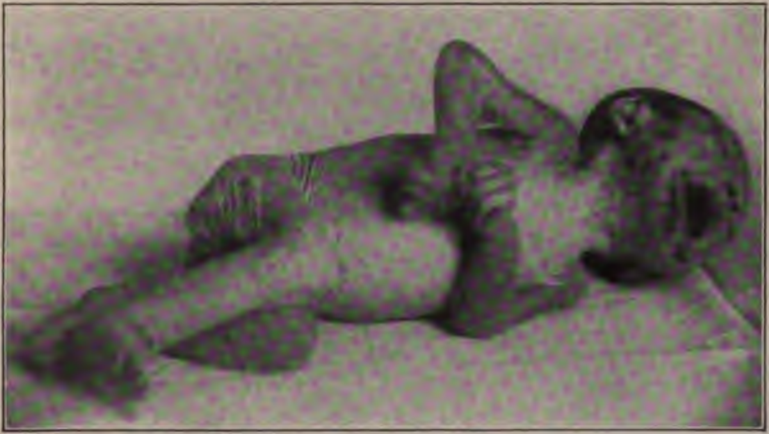

FIG. 75.— Congenital syphilis.

Symptomatology.— The symptoms vary greatly in severity from cases showing good nutrition and only one or two slight lesions, to such severe infection as to produce early death. In the latter case, the fetus may be attacked in the uterus resulting in abortion more or less early in pregnancy. As the disease lessens in severity in one or both parents the pregnancies will be longer in duration and finally an apparently healthy infant may be born. While there may be evidences of syphilis at birth, the onset is often delayed until weeks or months afterwards. In the majority of cases the primary symptoms will be noted before the end of the second month. The earlier the disease manifests itself after birth, the graver will be the nature of the attack. Very early syphilis is usually accompanied by emaciation, severe coryza, cracked and ulcerated lips, eruptions of bullæ, particularly upon the palms of the hands and soles of the feet, and evidences of visceral and bony disease. In the older cases there may be no apparent interference with nutrition, and possibly one or two mucous patches may be the only active manifestations of the disease. As noted in the pathology, almost any structure of the body may be involved in the course of the disease.

The skin rashes often develop rapidly and are apt to be less symmetrical than those seen in adults; they are likewise polymorphous, as several different forms of eruption may be exhibited at the same time in a given case. There may be an eruption of small round pink spots, disappearing on pressure, and usually appearing first on the lower portion of the abdomen. These may later take on a coppery discoloration. A papular syphilid may be seen in the form of small or large flat papules which are not so apt to group themselves into lines and circles as in older subjects. Neither are they so solid and deeply infiltrated as in the adult. Upon the palms and soles these papules may be very abundant and fuse together, presenting a thickened, dull-red surface. The vesicular syphilid is not common; the vesicles may be associated with pustules, and appear in closely-arranged groups about the mouth and chin or various other parts of the body, es-

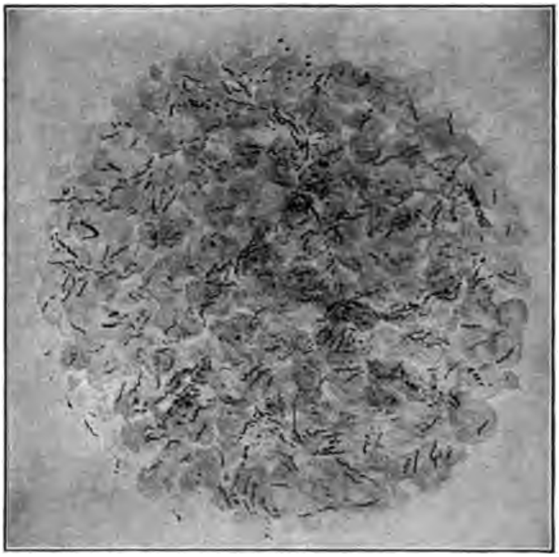

FIG. 76.— Section of liver from syphilitic infant, showing large numbers of spirochetæ.

pecially the nates and hypogastrium. Pustules may appear on the face, buttocks and thighs. Pemphigus, so-called, is seen only in the severer forms of the disease and then preferably on the palms of the hands and soles of the feet. A smoky discoloration of the skin, seen most distinctly in the prominent parts of the face, such as the eyebrows, cheek-bones, and bridge of the nose, may occasionally be the only manifestation on the skin. There is apt to be a dryness of the skin whcih may hang in loose folds from the general cachexia.

The mucous membranes are early affected. One of the most typical symptoms is the coryza. At first there may be a serous discharge which gradually becomes worse until the nasal secretion takes on a purulent or even a bloody character with excoriations of the upper lip. The secretion may become inspissated, forming crusts, which may completely block up the nasal passage. There is often flattening of the bridge of the nose from interference with respiration. Mucous patches are oftenest seen in the mouth, about the nose, upon the scrotum, vulva, labial commissures, and occasionally at the umbilicus. Deep fissures sometimes form at the corners of the lips, even extending well out into the cheek. There may be enlargement of the epitrochlear, cervical, cervicomaxillary, axillary, and inguinal lymph-glands but there is not a general adenopathy. Condylomata are sometimes found about the anus.

The long bones should be carefully examined for enlargement and thickening of the epiphyseal and distal ends. The epiphysis may even be separated from the shalt, when crepitation will be found upon careful handling. Dactylitis is usually confined to one phalynx which will be enlarged to double its normal size, but there is not apt to be much involvment of the soft parts; several phalanges are sometimes attacked. Onychia, often followed by ulceration around the nail, is occasionally seen. The first teeth are delayed, poorly developed, and will probably undergo early decay.

A profound anemia is sometimes seen, characterized by a diminution and alteration of the red-blood corpuscles, the appearance of megalocytes and microcytes and of nucleated erythrocytes. There is leukocytosis which may become extreme.

There may be sufficient disturbance of nutrition to induce an atrophy of all the structures of the body, the infant persenting a weazened appearance. This is oftenest seen in bottle babies and some infants that are nourished on the breast may remain plump and well nourished throughout the course of the disease with only a few mucous patches to give evidence of a mild infection.

Diagnosis.— It is usually easy to diagnosticate the disease from some of the pathological or clinical manifestations just described. In cases of marasmus, if there has been no chronic indigestion, particularly if the infants have been fed on the breast, syphilis may be suspected. Chronic coryza is suspicious and mucous patches will made certain a diagnosis. The following points are characteristic of syphilitic lesions: They are general in their distribution, but ambulatory and changing, and usually present a reddish-brown tint; where crusts form they are fairly thick, with a tendency to accumulate in layers, and when cicatrices form they are smooth and long, surrounded by a pigmented areola. The bony lesions of syphilis, tuberculosis and rickets may be confused. Morrow gives the following points of differentiation between syphilis and tuberculosis: 1. Syphilis exhibits a marked predilection for the long bones; its habitual localization is in the diaphysis, and almost always at its terminal extremity. Tuberculosis is almost exclusively situated in the epiphyses, rarely affecting the shaft. 2. In syphilis there is a marked enlargement of the bone by more or less voluminous tumors or hyperostoses, with little or no involvment of the soft parts: in tuberculosis the tumefaction is due less to increase in the size of the bone than to edematous infiltration of the soft structures. 3. In syphilis there is little tendency to suppuration and necrosis; in tuberculosis the pyogenic tendency is marked. 4. In syphilis, osteocopic pains, with tendency to nocturnal exacerbation are a pronounced feature; in tuberculosis the pain is dull and heavy, not aggravated at night. 5. The osseous lesions of syphilis rarely react upon the general system, while those of tuberculosis often determine a marked impairment of the general health.

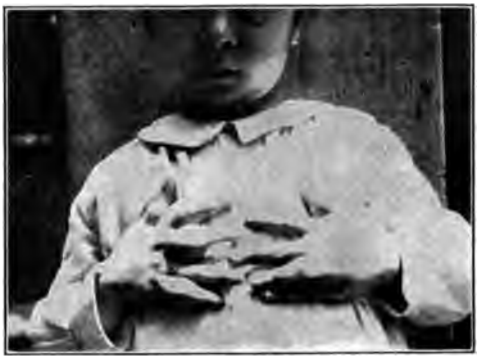

FIG. 77.— Syphilitic dactylitis.

In differentiation of syphilis from rickets, epiphyseal swellings under six months are very apt to be syphilitic. In syphilis the epiphyseal swelling may be unilateral, but it is always symmetrical in rickets. In doubtful cases the swelling must be subjected to specific treatment. It is well to remember, however, that rickets and syphilis may coexist in the same case.

Prognosis.— The earlier the symptoms appear after birth, the severer will be the type and the worse the prognosis. Breast-fed infants have a much better chance than those artificially fed. If the digestion remains good and the manifestations of the disease are not severe, complete recovery takes place and the infant may grow up healthy and strong. The average prognosis, however, is bad. Kassowitz states that one-third of all syphilitic children die before birth, and among those who are born 34 per cent. die in the first six months of life.

Treatment.— Parents who exhibit any specific symptoms or who have had syphilitic children should be subjected to specific treatment in the hope of avoiding infection of the fetus. Mercury is the specific remedy and may be administered to an infant either externally or internally. Daily inunctions of mercurial ointment, mixed with from two to eight times its quantity of vaseline or rose ointment, may be employed. A lump about the size of a small hickory nut may be rubbed on the inside of the thighs or in the axillæ, the parts having previously been cleansed with soap and warm water. It is more cleanly to apply five drops of a 10 per cent. solution of oleate of mercury three times daily. Internally, mercury with chalk is one of the best preparations in doses of one-fourth to one grain three times a day. Calomel, in doses of 1/20 to 1/6 grain, three times daily, will have a more rapid action when such is desired, or bichlorid of mercury 1/200 to 1/60 grain may be given. If the latter induce intestinal irritation, a menstruum, containing bismuth, will usually allay it. When mercury is given for a long time it is well to occasionally change its form, although in syphilis it is a tonic, acting like iron in anemia. The nostrils must be kept clear, using, if necessary, some bland oil like albolin. Mucous patches and excoriations must be kept clean and dusted with calomel and bismuth, equal parts. It is usually necessary to give mercury for at least a year, with occasional intervals of tonic treatment. In visceral lesions and where the bones are involved and evidence of gumma in any part of the body appears, iodid of potassium, in doses of 1 to 5 grains, will be indicated. The general care and feeding is most important. While the infant should not, if possible, be taken from the mother's breast, it must never be given to a wet-nurse.

Ehrlich's Preparation.— Recently there has been placed on the market a drug under the trade name of neosalvarsan. The drug is an arsenic preparation, and must be given in large doses in order that it may produce its effects quickly, as otherwise the spirocheta become "arsenic fast," *i. e.*, are not affected by arsenic.

Neosalvarsan is a much safer preparation for children than salvarsan. Following the injection there is a rapid improvement of all the symptoms. It is a mistake to suppose, however, that there is a complete cure from one or more injections of the drug. As a rule it is necessary to continue the use of mercury in some form not only before but after the treatment with neosalvarsan. When given intramuscularly there is some danger of the formation of a slough. Injection into the deep tissues is always accompanied by pain. The dose is about 0.04 per pound of body weight.

As neosalvarsan is a neutral salt its preparation is a simple matter, the drug being mixed with cold distilled water. The injection into a child's vein is not a simple matter. Occasionally the vein can be directly entered through the skin, but not infrequently it is necessary to expose the vein. At the present time a 5 per cent. solution of the drug can be injected into the blood stream with no ill effects.

These injections of neosalvarsan should not be given by the general practitioner, but should be left to those who have perfected their technic by special study. Whenever possible the case should be in a hospital where there are special facilities for sterilization and skilled assistance. It is a method of treatment which should be reserved for syphilitics who need rapid heroic treatment or for those cases not doing well on routine treatment.

The course of the disease should be carefully followed by the Wassermann reaction, and occasional tests should be made after all symptoms have disappeared.

Late Hereditary Syphilis.

This form of syphilis comprises those cases in which early evidences of the disease have either not existed or have been in such slight form as to have been overlooked. Late hereditary syphilis may manifest itself either in certain active lesions plainly to be attributed to this condition or by certain developmental defects that may easily be confused with tuberculosis or rickets.

The secondary teeth are affected in a way that has been considered pathognomonic. The principal change is noted in the two superior middle incisors, which are small, peg-shaped with scooped-out grinding edges, and placed at such an angle that the cutting borders, if continued, would meet. They may occasionally be deflected outward, and are known as Hutchinson's teeth (Fig. 77). Ulceration of the palate, usually, beginning in the center, may take place and be followed by caries or necrosis of the bone. There may be simultaneous or consecutive deep ulceration of the soft palate, pharynx, and naso-pharynx at any time previous to the age of puberty. Large, indolent mucous patches may exist in the mouth, and there may be ulceration about the lips leaving long scars, especially at the commissures. The nasal bones may become necrotic with depression of the bridge from destruction of the bony arch.

A periostitis, accompanied by a thickening on the surface of the bone, may involve the long bones, especially the tibia, ulna, radius, and humerus. The lesion may be multiple and symmetrical, although occasionally unilateral. Gummata, involving the bones and occasionally the soft tissues, may be seen, and, in the latter case, may break down with ulceration and leave large scars. Interstitial keratitis, without much congestion of the conjunctiva, is not infrequent, and is liable to be followed by corneal opacities; although primarily attacking one eye, it may involve the other. There may coexist an indolent iritis without the usual severe pain and photophobia. A chronic form of otitis may be followed by deafness. Painless enlargement of one or both testicles may be caused by syphilis, but there will be apt to be lesions in other parts of the body to aid in the diagnosis when this occurs. In many cases all the evidence of syphilitic taint in childhood will be found

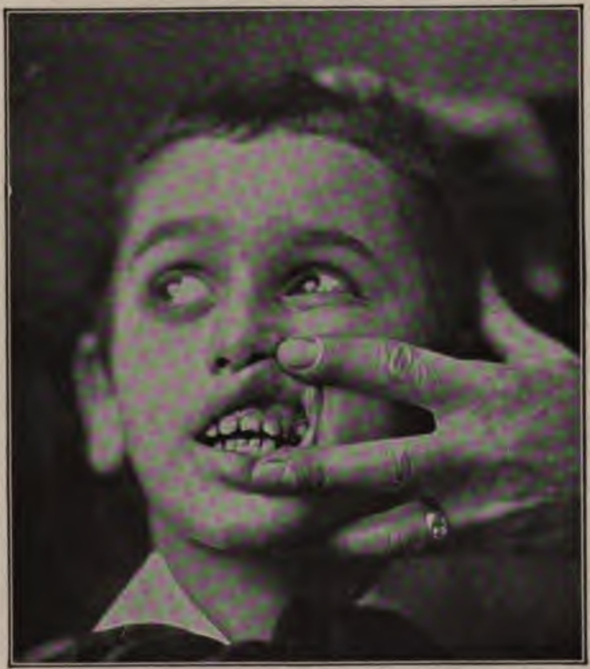

FIG. 78.— Hutchinson's teeth. (*Dr. Frauenthal's case.*)

in arrested and perverted development. As an example, the testicles at puberty may be about the same size seen in very early childhood, and in girls in absence of mammary development, delayed menstruation and a non-appearance of hair on the genital and axillary region may be noted.

Veeder and Jeans in their recent report state that the incidence of manifest hereditary lues of the late type is much greater in proportion to the incidence of early syphilis than previous figures would indicate. Lesions of the central nervous system appeared in 43 per cent. of their cases. Acutely developing lesions responded promptly to intravenous injections of neosalvarsan, but permanent results are to be obtained only by prolonged, intensive mercurial treatment.

The Wasserman reaction, even if once negative, returned if the treatment was discontinued, and a negative reaction could not be obtained in some cases even after two years' active treatment. In other words it is felt that late hereditary lues cannot be eradicated.

Treatment.— The treatment of the later forms of syphilis must depend on the activity of the morbid process. Mercury in some form should be exhibited when there is evidence of active syphilitic disease. Iodid of potash is also to be given in fair doses, three to five grains. The treatment should also be directed toward improving the nutrition of the child in every way. Good food, iron, cod-liver oil, are all of value in aiding healthy growth and development in these retarded cases. (See treatment with neosalvarsan, page 273.)

Acquired Syphilis.

The syphilis detected in early life, although usually hereditary, is not necessarily so, but may be acquired. A primary sore upon the genital tract of the mother can possibly infect the infant during birth. The nurse or attendant may have a primary lesion upon the breast or lips. Much more common will be infection from some secondary lesion, especially a mucous patch upon the mouth or lips. There are many ways in which the blood or infective secretions of a syphilitic patient may come in contact with a solution of continuity in the skin or mucous membranes of an infant or child. A chancre will then appear at the point of contact, followed in due time by the later manifestations of the disease. Rarely, in older children, the disease may be contracted by sexual contact. The symptoms and treatment present essentially the same elements as in adult life, and hence will not be considered here. The acquired disease in the infant or young child tends to be milder than the hereditary form in its symptoms and less apt to affect seriously the general health and development.

Epidemic Cerebrospinal Meningitis.

(*Cerebrospinal Fever.*) (*Spotted Fever: Obsolete.*)

This form of meningitis is an acute infectious disease due to the diplococcus intracellularis, characterized by motor and sensory cerebral and spinal symptoms.

Etiology.— The disease, without question, has its specific germ in the diplococcus intracellularis meningitidis, fully described by Weichselbaum in 1887.

This organism, fortunately of low resistance, gains access to the general system through the blood or through some local determination in the nasopharynx, ear, or eye, and in those with depleted vitality and lowered resisting force finds suitable soil for its propagation. It usually occurs in epidemic form, although occasional sporadic cases are seen from time to time, especially in the large centers.

The spring of the year, after prolonged confinement to ill-ventilated and superheated apartments, finds the greatest number of predisposed individuals. It is essentially a disease of the young. Our youngest case was twelve weeks old, although Rotch, of Boston, reports a case six days old. The second year claims the greatest number of victims.

Pathology.— In making postmortem examinations of those dying with the disease, we find, as a rule, an exudative inflammation of the pia arachnoid of the brain and spinal cord. The amount of infiltration found, however, often does not correspond to the gravity of the symptoms observed during the life of the patient. The degree of infiltration varies from an intense hyperemia to a fibrinoplastic seropurulent or purulent exudate. This exudate is most marked at the base of the brain and along the fissure of Rolando and the dorsal portion of the cord. In the ventricles is found a cloudy or opaque serum and in a few cases pure pus. The effusion in the subarachnoid space (and it must always be kept in mind that there is more fluid in the subarachnoid space in children than in adults) is increased in normal amount. Frequently there is seen a parenchymatous degeneration of the kidneys, degeneration of the heart muscle and the muscles in general. There will also be found in a number of cases multiple abscesses, septic joints and ecchymoses of the skin as a result of complicating conditions.

Symptomatology.— In cerebrospinal meningitis the symptoms vary according to the type of the disease present. The onset is usually sudden and abrupt. The malignant types are seen largely in the epidemics only, and are responsible for the large mortality record. In this type headache, vertigo, vomiting, and high fever are soon followed by coma and death.

The symptoms in the sporadic cases will vary with the gravity of the local lesion and the intensity of the toxemia. The history of the prodromal period may be of material assistance in establishing the diagnosis; there is malaise, headache, chills, loss of appetite, body pains, and some rise of temperature. Later frontal headache is complained of and succeeded by vomiting, restlessness, and rapid pulse. Herpes on the lips and nose, retraction of the posterior cervical group of muscles, hyperesthesia and opisthotonos are observed. The general nutrition suffers severely and emaciation is steady and progressive. Delirium, stupor, or profound coma develop. Convulsions of a severe type (particularly in infants and younger children) are apt to occur at or near the beginning of the disease. The loss of flesh and strength is rapid and marked. Photophobia and irregularity of the pupils with loss of pupillary light reflex and nystagmus are quite regularly present. Neuroretinitis is found on ophthalmoscopic examination of the fundus in some cases. The respirations vary with the stage of the disease; they are increased when the fever is high, sighing and shallow when stupor begins and are irregular when coma develops. The blood shows a leukocytosis rarely under 25,000 to the cubic millimeter. The temperature curve is not characteristic and bears no relation to the prognosis. The excursions are wide and varied. The pulse is rapid and sometimes irregular. Ecchymotic spots and purpuric areas are seen in some of the fulminating cases, but a roseola or an erythema is more apt to occur in the sporadic cases.

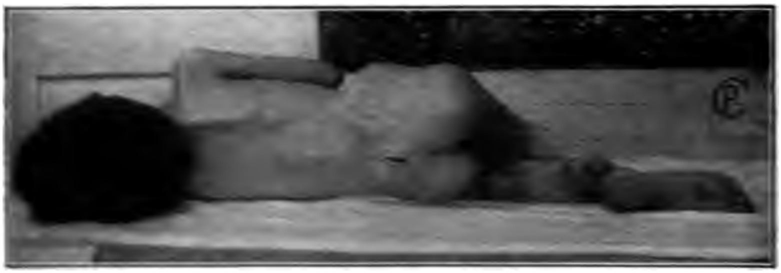

FIG. 79.—Cerebrospinal meningitis with marked opisthotonos.

The reflexes will help to establish the diagnosis, but must be interpreted with caution. The tache cerebrale is always obtained, but is only a minor confirmatory sign. The Babinski reflex, or extension of the great toe on irritating the plantar surface of the feet, is confirmatory, especially in children over two years of age, although negatively it may be of assistance. Kernig's sign, which is obtained in nearly all the cases at some stage or other, is also present in all forms of cerebral irritation. Brudzinski's sign is a rather recent but valuable sign in meningitis. It is elicited by placing the left hand on the thorax and forcibly and rather suddenly depressing the chin to the sternum. If the extremities have been previously relaxed, they will now be quickly flexed until a crouching attitude is assumed.

Macewen's sign, or the hollow note elicited by percussion over the parietal bone, is obtained only in those cases in which fluid has accumulated in excessive quantity in the ventricles. The rigidity of the neck, with dilatation of the pupils when attempts are made to flex the neck, is also a helpful and confirmatory sign of meningitis.

The urine in the course of the disease often contains albumin and hyalin casts, the result of toxic substances in the blood stream. Loefler and Gourand, of France, have called attention to the fact that in the beginning of the disease large amounts of urine of low specific gravity are passed, containing a high percentage of urea. An examination of the blood will assist in making a differential diagnosis. Leukocytosis, principally of the polymorphonuclear cells, is present, while the mononuclear elements predominate in the tuberculous type of meningitis. Lyons classifies the order of importance of the clinical signs. First in importance he noted the value of lumbar puncture in 95 per cent.; second, rigidity of the neck in 95 per cent of the cases; third, Kernig's sign in 90 per cent. of cases; fourth, Brudzinshi's sign early in 75 per cent., later in 94 per cent. of cases; fifth, contralateral sign early in 33 per cent., later in 50 per cent. of cases; sixth, Babinski's sign in 11 per cent. He places no value upon patellar reflexes as a diagnostic aid in his cases.

Lumbar Puncture.— Although the diagnosis can often be made from the clinical phenomena alone, confirmation and temporary relief from intracranial pressure symptoms are afforded by lumbar puncture, and it is also an aid in establishing the diagnosis and prognosis. The procedure is not difficult, and if performed with aseptic precautions and a due regard for the anatomy, is productive of no harm. The technic is as follows (also see Fig. 19, page 51):

Infants in whom opisthotonos has not yet developed may be placed over a pillow at the end of a table, the spine and outlying soft parts being thus put on the stretch. The spine may be entered between the third and fourth lumbar vertebræ. This space is found by an imaginary line drawn across the iliac crests and intersecting the spine. In older patients, or those with opisthotonos, it is necessary to place them on their side and enter to one side of the median line. The needle of an ordinary good-sized aspirating syringe cannot be improved upon for the procedure. A small trochar and cannula may also be used and 10 to 15 c.c. (½ ounce) should be withdrawn, provided the fluid flows freely, as this amount will include fluid from the cranial cavity and lead to more accurate bacteriological results. It is not wise to withdraw more than 30 c.c. or an ounce at a sitting. In infants with an open bulging fontanel, an amount can be withdrawn which will appreciably depress the fontanel. Dry taps, which occasionally occur, are usually the result of imperfect technic, the operator either not reaching the spinal canal, or the needle becomes obstructed with blood. If the exudative processes have occluded the connection between the ventricles of the brain and the cerebral and spinal subarachnoid spaces, as sometimes occurs in well-advanced cases, the opening may be partially occluded and the fluid flow very sparingly. In cerebrospinal meningitis the fluid obtained is generally clouded or turbid, sometimes it is purulent or again varies from time to time. In a small percentage of cases it is quite clear throughout. It contains the diplococcus intracellularis, and in some aspirated fluids in addition, staphylococci and streptococci are found. Polynuclear leukocytes predominate and contain the specific organisms.

Complications.— Those which may be attributed more directly to the disease itself are those of the eye, the ear, the brain, and the joints. The drum frequently is infected and may result in deafness and the labyrinth is apt to be likewise involved.

Chronic hydrocephalus develops in a number of cases beginning either during the acute stage or in convalescence. These children are usually mentally deficient or idiotic. Rarely an arthritis develops in one or more joints.

Differential Diagnosis.— As a rule, the symptoms are typical enough to make the diagnosis of meningitis, which is confirmed and further differentiated by lumbar puncture. The sudden onset, the headache, fever, vomiting, or convulsions in the face of an epidemic are especially significant. Meningitic symptoms in typhoid fever with rapid onset are often confusing. The blood examination for leukocytosis and the Widal reaction should be used to assist in the differentiation. Tuberculous meningitis, especially in infancy, is often confused with sporadic cases of cerebrospinal meningitis, and indeed the pathological examination of the spinal fluid may in some cases be absolutely necessary to differentiate them. The slow onset in tuberculous meningitis, the low leukocyte count, and the absence of hyperesthesia are distinctly helpful points.

Prognosis.— We can base our prognosis on the following facts: Sporadic cases have a greater natural tendency to recovery. Initial symptoms do not, as a rule, indicate the subsequent course. Mixed infections as found in the spinal fluid indicate a general septic condition and an unfavorable prognosis. The younger the patient the more unfavorable the outcome. Do not interpret as a sign of restoration to health a temporary remission with return of consciousness from coma.

Widely dilated, rigid pupils, unvarying coma with slow pulse, subnormal temperature, persistent opisthotonos, and convulsions are signs tending to a fatal termination.

Treatment.— The germ and its toxins must be combated. Detailed study of the portals of entry of the infecting organisms has thus far failed to establish much that is new. Care of the nasopharynx as insisted upon by Jacobi and Caillé is a local measure productive of much good, especially in the crowded centers. School inspection and a higher standard of sanitary regulations in every district will do much to prevent epidemics of this disease.

Serum Treatment.— The promising results that have been obtained from the use of Flexner's antimeningitis serum when used by the subdural method warrant its use in cases in which the diplococcus intracellularis has been demonstrated. It is ineffective in other conditions. If the bacteriological test is impracticable or would be unduly delayed, the serum injection is advisable in those cases in which a cloudy fluid is withdrawn by lumbar puncture. No harm is done if the disease is of another type. The earlier the serum is injected the better the results. By its use this long exhausting disease appears to be shortened and serious complications prevented. The serum is injected through the same needle after the withdrawal of at least 30 c.c. of spinal fluid, or until the drops flow only 4 to 5 to the minute. The serum is warmed to body heat and slowly injected into the canal unless undue resistance contraindicates. Although a syringe may be used, it is best to allow the serum to flow in by gravity, using a funnel (or even the barrel of the syringe) attached to a piece of one-quarter-inch rubber tubing about a foot and a half long. An infant should receive 10–15 c.c. of the serum, while a child may take 20 c.c. It is wiser never to inject more than the fluid withdrawn, preferably 5 c.c. less.

Cases with severe symptoms should be reinjected every twelve hours until there is improvement. Milder cases, once a day will answer. When the symptoms abate or the fluid on examination gives no culture, the injections are stopped.

General Treatment.— A very important element of the treatment is conservation of the patient's strength by well-regulated nourishment and skillful nursing. Care of the excretory functions and relief of pressure symptoms are important elements of the treatment. The patient should be isolated in a well-ventilated quiet room, the eyes shielded from the light, the head and the neck being raised upon a pillow to relieve in part the congestion of the brain. The bowels are kept open by calomel or enemas. The diet may be fluid or semifluid, of a stated quantity, and careful note kept of the amount ingested. Forced feeding should be resorted to if necessary by gavage. Water should be given freely. An ice-bag should be applied intermittently to the head if the temperature rises above 101° to 102° F. Warm baths at 115° F. for twenty minutes, twice a day, with cold applications to the head, do much to produce comfort and allay pain. While in the bath the nasopharyngeal toilet can be made with normal saline solution. Colonic irrigations are used to eliminate the toxins, promote the flow of urine, and to stimulate the patient. When they are given at a temperature of 80° F. they also control the higher rises of temperature.

The baths will also prevent in great measure the formation of bed-sores, and the necessary change of position will be beneficial to the pulmonary circulation.

For the relief of marked restlessness or convulsions bromids and chloral per rectum are to be preferred to the opiates. Camphor in sterile olive oil hypodermatically (one grain to ten minims) is given when stimulation is necessary.

Lumbar Puncture: This procedure will be indicated for (a) purposes of diagnosis; (b) in infants where there is a bulging fontanel or in children where Macewen's sign can be elicited, and in any case to control convulsions or sudden onset of coma; in other words, symptoms of intracranial pressure, and (c) for the injection of the antimeningitic serum.

Poliomyelitis.

(Infantile Paralysis. Essential Paralysis of Children.
Acute Atrophic or Wasting Paralysis.)

Definition.— An acute inflammatory process taking place in the anterior horns of the spinal cord, accompanied by a sudden and complete paralysis of various groups of voluntary muscles, followed by a rapid wasting of the affected muscles.

Etiology.— The specific causative agent is a non-filterable organism, ultramicroscopic, about one-quarter the size of the streptococcus, and has been recovered by Flexner through the nasal mucous membrane. It is first located in the olfactory lobe, then in the medulla and later in the central nervous system. It is taken up by the lymphatics. Thus far it has not been found in the blood current. Flexner is a firm believer in carriers as a means of spreading the disease and originating new epidemics. The organism may remain alive in the body for a year and a half.

Special liability to the disease exists below the age of three years, fully half of the cases occurring during this period. The common house fly is regarded as a carrier of the disease. Cases occur oftenest in warm weather and boys are attacked oftener than girls. Occasionally the disease comes on after exposure to cold; it may also be seen in connection with certain infectious fevers, such as scarlatina and typhoid fever. The relation between these factors and the disease, as to cause and effect, is somewhat uncertain.

Pathology.— The inflammation that is localized in the anterior horns of the spinal cord seems to be induced by some toxin brought there by the blood current. There is dilatation and proliferation of the endothelial walls of the blood-vessels of the part of the cord affected. The central arteries of the spinal cord are intensely congested, followed by those of the anterior median fissure. As the posterior horns are chiefly supplied with blood from the peripheral arteries, they are less affected when the inflammation is limited to the distribution of the central arteries. After engorgement of all the arterial twigs, diapedesis occurs and infiltration of the tissue by small cells and serum. According to Goldschreider, it is this choking of the gray matter by the inflammatory products that leads to the suspension of functional activity, and when, as in many cases, from impoverished nutrition the cells of the anterior horns are actually disintegrated by the inflammatory products, permanent destruction of the nerve tissue ensues. The ganglion cells soon show granular degeneration, which may be followed by disintegration and atrophy. The cells in the anterior horns are arranged in groups having definite physiological motor and trophic functions. When these cell groups are finally destroyed and replaced by connective tissue, the parts they innervate will likewise undergo degenerative changes. The muscles become atrophied, and their fibrils replaced by connective or adipose tissue.

Symptomatology.— The invasion is usually acute with evidences of general infection. There may be gastroenteric or nervous disturbances with fever. The disease often begins with vomiting, and diarrhea may occasionally ensue. In other cases, general convulsions are seen at the beginning. Very rarely stupor or coma may follow the convulsions and last for a day or so. The temperature is frequently high at first, perhaps reaching 104° or 105° F.; in other cases it is slight — not more than 100° or 101° F. In rare instances the initial symptoms may be so mild as to escape attention and the paralysis is the first thing noted. In the majority of cases, however, some initial symptoms, more or less marked, will last from one to four days before paralysis is discovered. Not infrequently pains in the limbs may precede and accompany the paralysis for a time, and thus simulate peripheral neuritis, but such pains do not last long. The most obscure cases are those in which the child is suddenly found to be unable to stand or walk, perhaps after being taken out of bed in the morning. The paralysis is absolute, the affected part being completely flaccid. It develops rapidly, usually reaching its full extent in from twenty-four to forty-eight hours; in rare cases it may be slower in onset, so that a week or even longer may elapse before it appears to reach its maximum extent. There is then a more or less rapid subsidence of the loss of power, but little change is to be noted during the first three or four weeks after the beginning of the attack. Most of the improvement will take place during the first three months, and after this interval any paralysis remaining will usually be permanent. The paralysis most often takes the form of monoplegia, the right leg being oftenest affected. The left leg and the right or left arm may become involved with a frequency usually in the order named. In severe cases all four extremities may be involved and even the muscles of the back and neck so that the child cannot sit erect or hold its head up. In very rare instances the medulla and base of the brain may be attacked, as well as the anterior horns of the cord, forming the disease called by Strümpell polioencephalitis. The cranial nerves may then become affected and the patient shows signs of bulbar paralysis as well. These severer types are more apt to be seen when the disease is epidemic. In other rare instances there may be hemiplegia simulating cerebral paralysis. Paraplegia is rare. Many cases will only show a paralysis involving one group of muscles, as the peroneal type. As the motor cells in the anterior horns are arranged in groups, the muscles involved will be found to have a coordinated physiological function. The limb affected is apt to be cooler than the other parts, and an atrophy soon affects the paralyzed muscles. The wasting may be noticed within a week or two, and at two or three months becomes very

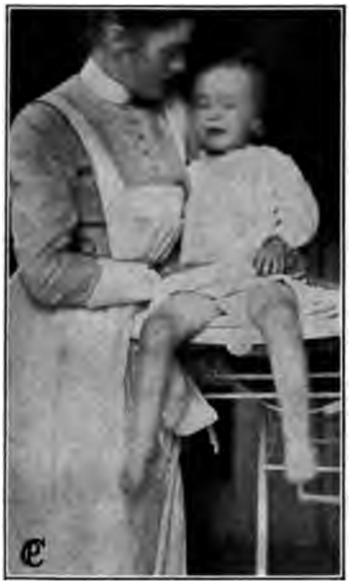

FIG. 80.— Foot drop in anterior poliomyelitis.

marked. Eventually various deformities result as the growth of bone is arrested and the whole limb becomes smaller. Where only one or two groups of muscles are affected by atrophy, the opposing healthy muscles will produce other deformities. In old cases, where a whole limb has been affected, there will be various grades of subluxation from a relaxation of the muscles and ligaments around the joints. The knee and shoulder are particularly apt to be involved in this way. The electrical reaction of muscles and nerves may prove helpful in recognizing the disease. While the galvanic and faradic responses may be increased in the first two days, there is soon a loss of response to the faradic current with a reaction of degeneration to the galvanic current shown by the anodal closure contraction being greater than the cathodal closure contraction. If the part affected responds to faradism within a few weeks it will probably not be permanently paralyzed.

The reflexes are lost in the affected muscles. The commonest example of this is seen in loss of the knee-jerk. Complete recovery of all the muscles affected is extremely rare, although the permanent paralysis may be limited to only one or two groups of muscles. Death may take place during the early course of the disease in the encephalic form during epidemics.

Diagnosis.— It is impossible to make a positive diagnosis before the onset of the paralysis, as the first symptoms resemble those of other acute infections. However, an absolute paralysis preceded by vomiting, fever or convulsions points to a spinal origin. In a few cases there may be early cerebral symptoms simulating cerebrospinal meningitis, but paralysis comes later, if at all, in the latter disease, and the stiff retracted head comes early. On lumbar puncture the fluid is usually found to be under pressure, but clear or opalescent. The cytological characters of a cerebrospinal meningitis are absent. It is not always easy to differentiate a palsy as cerebral, spinal or peripheral. The following points may be considered as helpful:

Cerebral (or motor projection fibers in spinal tracts)	Spinal (gray matter)	Peripheral (nerves)
Onset sudden, with convulsions	Onset sudden, with fever	Onset gradual (1 to 4 weeks).
Usually affects entire limb and incomplete. Paresis.	Affect muscular groups having coordinated functions and not supplied by simply one nerve. Total paralysis (rule).	Affects muscles supplied by one nerve. Total paralysis (rule).
Hemiplegia (rule)	Monoplegia (rule) leg	Paralysis symmetrical.
Monoplegia (rare) arm	Hemiplegia (rare)	Paraplegia the rule.
Paraplegia (very rare)	Paraplegia (rare)	Upper, lower or all four extremities.

Cerebral (or motor projection fibers in spinal tracts)	Spinal (gray matter)	Peripheral (nerves)
Muscles stiff or rigid	Muscles flaccid	Muscles flaccid.
Sensory disturbance usually absent. If present, partial anesthesia	Sensation not affected; sometimes, but rarely general pains very early in disease.	Association of sensory with motor paralysis. Numbness, tingling, sensations of heat or cold. Limb usually painful along course of nerves affected.
No atrophy, or late from disuse..	Early and rapid atrophy..	Atrophy rapid.
Deformity early. Athetosis	Deformity late	Permanent contractures rare.
Growth of part not much impaired	Growth much impaired...	Growth not impaired.
Temperature of part little affected	Some coolness in affected limb.	Slight coolness of muscles affected.
Increase of all reflexes	Loss of reflexes	Loss of reflexes.
No reaction of degeneration	Always reaction of degeneration.	Usually reaction of degeneration.
Mind often affected. Weakness or epilepsy.	Mind clear and no mental sequelæ.	Mind clear and no mental sequelæ.

Prognosis.— A more or less rapid lessening in the extent of the paralysis nearly always occurs during the first few weeks after the beginning of the attack. There will be little or no improvement after the third or fourth month. The prognosis for muscles that waste rapidly is poor. A reaction to the faradic current is a sign of beginning improvement. After a year the condition will be absolutely stationary as far as the paralysis and trophic disturbances are concerned. Complete recovery is exceedingly rare, and is more apt to be seen in the epidemic form. In some cases, however, so few muscles are permanently paralyzed as to simulate entire recovery. The prognosis for life is exceedingly good, although a few will occasionally die early in the attack in epidemics of the disease with symptoms of severe infection. As there is no involvement of the brain, the mind will not be in any way affected, and there are no late sequelæ such as epilepsy.

Treatment.— Recent research work would indicate that mild antiseptic lotions applied to the nasopharnyx, may be valuable for prophylaxis. Urotrophin in fairly large doses may be administered as a preventative during epidemics as well as during the course of the disease. If seen early, and the temperature is high, ice-bags may be applied to the spine. When this is discontinued, stimulating applications may be applied, such as one part of turpentine in two parts of camphorated oil, sprinkled over a strip of flannel. Long strips of mustard paste may be applied to the spine. The bowels should be kept open and a mild, unstimulating diet given. Any irritability of the nervous system may be controlled by bromid of sodium — from three to five grains, every three or four hours. Absolute rest, in an easy, recumbent position, is very important during the first few weeks. No effort must then be made to stimulate the paralyzed muscles, and the parts must, if necessary, be kept in a natural position by straps or orthopedic apparatus to prevent early deformity by contractures. It is especially necessary in the case of drop-feet to raise and support these parts, after the symptoms of central nerve irritation have passed — usually in about three weeks. Strychnin and electricity may now be employed. If the muscles do not respond to the faradic current, galvanism may be used. When the pain ceases and the patient can be handled without discomfort, massage, at first light and later deeper, should be given the affected parts.

Re-education, passive movements by the use of pulleys, and bran baths are all needed in the attempt to restore function. Persistent efforts, even when the returns seem meager, should be made.. The late deformities of the disease come before the orthopedic surgeon for correction. Tenotomy, various braces, and induced anchylosis for the "flail-joints" may all be required.

The Epidemic Form.

The occurrence of epidemics of paralysis in children has been reported in recent years by a number of observers. They have generally been considered as cases of poliomyelitis, and have naturally provoked renewed discussion as to the essential cause of this disease. The abrupt onset, the fever, the gastric disturbance, occasional attacks of convulsions seen both in the epidemic and endemic forms of the disease point to its infectious nature. In the epidemic form, a considerable variation from the usual type of the disease has been noticed, some cases presenting the symptom-complex of Landry's paralysis. Medin reported an epidemic during the summer of 1887 in Stockholm, with some fatal cases. In this country Caverly reported an epidemic occurring in the summer of 1894 in Rutland, Vermont. One hundred and thirty-two cases were reported, occurring oftenest in strong, healthy children. Many of the cases showed marked hyperesthesia of the skin and others exhibited muscular rigidity of the neck or back. A curious feature of this epidemic was that domestic animals were affected by the disease. Horses, dogs, and fowls became paralyzed, and an autopsy on a horse and fowl showed the lesions of poliomyelitis. This epidemic occurred in a very dry season, and the same thing has been noted in most other epidemics.

An interesting epidemic, reported by Chapin, occurred during the summer of 1889, at Poughkeepsie, N. Y., most of the cases being attacked between the middle of July and the middle of August. A peculiarity of this epidemic appeared to be the existence of severe pain in the parts affected by the paralysis. A number of the cases carefully examined showed absolute paralysis of the limbs affected, with loss of reflexes and apparently considerable pain on handling the part.

During the summer of 1907 an epidemic of considerable proportion existed in New York and the surrounding country. In this epidemic pain in the extremities formed a marked feature, and in some cases marked cerebral symptoms were noted. Many of the cases showed great gastroenteric irritation at the onset of the disease. Occasionally headache and rigidity of the neck simulated cerebrospinal meningitis. A few cases were reported in which symptoms of bulbar involvement occurred. A number of deaths were also reported during this epidemic, the fatalities occurring early in the disease. The following points will fairly represent the peculiarities of the epidemic form of paralysis in children:

1. The disease is occasionally fatal, especially early in the attack. The endemic form is rarely, if ever, fatal in its ending.

2. There are great variations in the extent of the paralysis in the epidemic form. Many cases show very extensive palsy, involving all the extremities and the muscles of the back and neck as well. Other cases show a very slight loss of power, and the disease is doubtless occasionally overlooked from this cause.

3. Pain seems to occupy a more prominent feature in the epidemic than in the endemic form. This pain may even last well along in the course of the disease. In the ordinary endemic disease, if pain exists it is not apt to last more than a day or so.

4. A certain proportion of cases in these epidemics seem to undergo a complete recovery. This rarely, if ever, happens in the endemic form.

5. The lesion tends to be more varied and extensive in the epidemic than in the endemic form. It may include the following conditions: Polioencephalitis of Strümpell; poliomyelitis; peripheral neuritis, and occasionally meningitis.

Rheumatic Fever.

(Acute Articular Rheumatism.)

Rheumatic fever is a febrile disease of the joints characterized by transitory inflammatory attacks which do not tend to suppuration.

Etiology.— The infectious origin of the disease is accepted as a fact; although the direc [illegible]l factor is still in dispute. The disease assumes certain characteristics in childhood which distinguish it from the adult type. The course is milder and shorter, while involvement of the heart is more frequent than in adults.

Single epidemics and a succession of epidemics have been reported from time to time. Several members of the same family may be attacked simultaneously.

The oral cavity and more particularly the tonsils have been regarded by many as the portal of entry of the infecting organism. Predisposing factors are exposure and residence in cold damp apartments. Heredity seems to play a distinct part if the predisposing factors are present.

The disease is not very common before the fifth year, although cases have been recorded during the nursing period. One attack predisposes to subsequent attacks.

Among the 76 cases studied clinically by Chapin the following were the ages:

6 mos.,	1	11 mos.,	1	20 mos.,	1	3 yrs.	1	4 yrs.,	2	5 yrs.,	4
6 yrs.,	6	7 yrs.,	3	8 yrs.,	11	9 yrs.,	9	10 yrs.,	5	11 yrs.,	8
12 yrs.,	7	13 yrs.,	9	14 yrs.,	4	15 yrs.,	2	17 yrs.,	2		

Symptomatology.— An attack may be preceded by languor, loss of appetite, mild tonsillitis, abdominal pains, and indefinite pains in the joints. With the localized pain there is a febrile reaction of variable intensity, 102–104° F., and occasionally there is vomiting. The knee- and ankle-joints are, as in adults, most frequently involved. In children the hip and cervical vertebræ and joints of the fingers and toes may be the areas attacked. Usually more than one joint is affected, but symmetrical involvement is not the rule. It is exceptional for the attack to persist more than a few days in any one joint. The joints, as a rule, are not exquisitely painful on active or passive motion, while the swelling, if any, is moderate. The fascia covering muscles may be attacked without any involvement of the joints. The sternocleidomastoid muscle is especially liable to such attack. The acid perspiration so commonly observed in adults is rarely present in children. A waxy appearance is observed in severe cases with insomnia, anorexia, and insatiable thirst.

The blood findings are of no assistance in making the diagnosis. Mild, almost afebrile cases may, however, be followed by serious involvement of the heart.

Complications.— These bear a direct relation to the toxins of the disease itself. Rheumatism in childhood is characterized by its cardiac complications: it thus must always be considered as a disease of serious import. Nearly half of all the cases leave permanent cardiac effects.

The mitral valve is most frequently affected. The involvement is accompanied by irregular rises of temperature and increased pulse rate. The symptoms accompanying valvular defects, however, may be the first indication for medical attention and lead to the discovery of their rheumatic origin. Pericarditis is present in 10 to 20 per cent. of all cases in children and is frequently associated with endocarditis, and is an important and often fatal complication. Serous, or serofibrous pleurisy, is a complication seen in severe and long-standing cases. Pneumonia and occasionally nephritis are rarer complications, in all probability due to mixed infection. A purpuric rash or an erythema may be seen as rheumatic manifestations. Chorea must be regarded as a distinct rheumatic manifestation and often may precede the disease. Involvement of the endocardium is not rare in cases of chorea. Rheumatic iritis is rare in childhood, but can be diagnosticated by a competent opthalmologist.

Rheumatic nodules occasionally appear under the skin, developing rapidly. They appear, as a rule, near the joints, and follow the course of the tendons. Sometimes they are painful on pressure. They may be from one to fifty in number, and may last for several weeks before absorption takes place.

Prognosis.— Rheumatic polyarthritis in children tends to quick recovery. Relapses are common, and it is in these secondary attacks that the endocardium most often suffers. Fatalities may follow severe complications.

Differential Diagnosis.— Septic arthritis as seen in scarlet fever and gonorrheal arthritis should be excluded, as should the rarer cases of pneumococcic arthritis. The history and the intense localization tending toward suppuration in the septic types will assist in making the diagnosis. A blood count in septic cases will show high leukocytosis. An exploratory puncture is often justifiable in establishing a prompt diagnosis.

Scarlatinal polyarthritides, as a rule, affect the wrist-joints first, then the shoulders, knees, and feet. They appear in the second or third week of the disease, and last about one week unless suppuration sets in.

Pneumococcic arthritis is seen usually in the first and second years of life as a sequel of a bronchopneumonia, or a lobar pneumonia. The pus contains diplococci which stain by the Gram method. As a rule the affection is limited to one joint.

Gonorrheal arthritis is rare in children, although often decidedly puzzling from a diagnostic standpoint, unless evidences of a previous gonorrheal infection are obtained. It appears some weeks following the local attack. The knee-joints are, as a rule, primarily involved, but in children it is very apt to be polyarticular. The articulations are extremely painful, there is a high irregular temperature and the effusion in the joints contains typical gonococci.

Syphilitic arthritis is symmetrical, and other evidences of the disease may be present.

Cases of epidemic poliomyelitis which complain of intense pain have been mistaken for rheumatism. The loss of the patellar reflexes and the electrical reaction will serve to distinguish them.

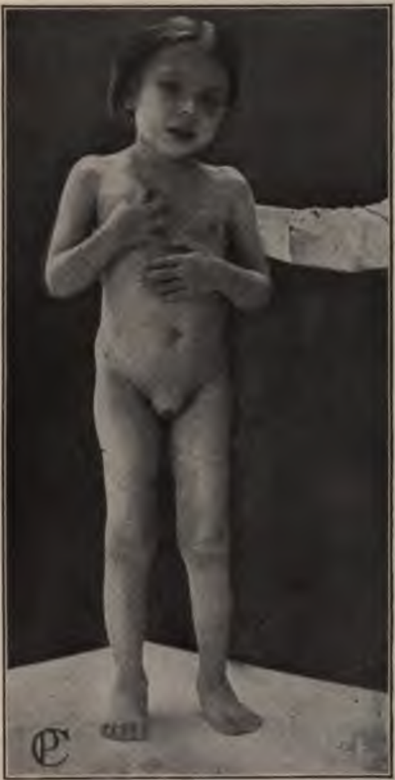

FIG. 81.—Gonorrheal arthritis, complicating gonorrheal vulvo-vaginitis. Polyarticular in distribution.

Scurvy in infancy may occasionally be mistaken for rheumatic polyarthritis. The history, examination of the gums, of the urine, the localization, and the X-rays will prevent a mistake in diagnosis.

Treatment. Prophylactic.—Children predisposed to rheumatic fever or who have had an attack of rheumatic fever or chorea should avoid exposure to dampness or cold. The tonsils, if hypertrophied, should be removed. The diet must be carefully regulated and all forms of intestinal fermentation promptly treated.

Management.—Rest in bed should be considered as the first and most important direction, and the patient should be kept in bed until all rheumatic manifestations have ceased. Wearing of woolen, linen, or merino undergarments is to be recommended.

The diet may consist of cereals, milk, paps, bread, and lemonade for the thirst. When the fever has passed, vegetables, eggs, and finally meats are allowed.

Drugs.— The salicylates in the form of the sodium salts or, better still, novaspirin are effective remedies to control the attacks. Rest in bed and the early exhibition of the salicylates are the only weapons against the cardiac complications. Severe cases should have trebled doses of the salicylate given in a starch enema by rectum every six hours until effect is produced.

Novaspirin in doses of 2 to 5 grains three or four times daily to a five-year-old child should be persisted in for a week or more.

Salol, aspirin, phenacetin, salipirin, and salophen (see Dosage, page 64) may be substituted if the above remedies are not tolerated.

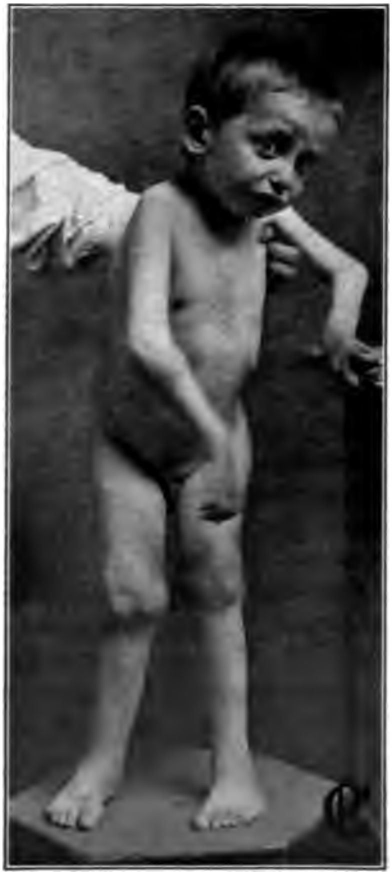

FIG. 82.—Chronic infectious polyarthritis.

The tincture of the chlorid of iron, five drops in water after meals in convalescence, is beneficial. However, if the diagnosis be correct, aspirin or sodium salicylate will give speedy relief. The joints should be enveloped in cotton wool. Immobilization with splints, especially with restless children, will often give considerable relief. An ice-bag is applied over the heart for an unduly rapid pulse or endocardial involvement.

Infectious Arthritides.

Following any of the acute infectious diseases, especially pneumonia, scarlatina and typhoid fever, there may result an active inflammation in the joints or neighboring bony structures. These arthritides result from bacterial invasion in some instances, and in others are apparently the result of the toxic products of the underlying disease. Suppuration may occur, as evidenced by fluctuation and tenderness. Aspiration is then indicated and, besides relieving the joint, assists in establishing the diagnosis from a bacteriological standpoint. These cases do not react to the salicylates or their derivatives, and are to be distinguished by the greater degree and rapidity of the involvement and the tendency to suppuration. The temperature often assumes the wide variations seen in sepsis of any part of the body.

Rheumatoids.

Formerly these affections were classed under the head of chronic articular rheumatism, and much confusion has resulted from attempts to classify them as following or developing from rheumatic fever.

One group of these cases often designated as villous arthritis results from thickening of the synovial sheath and an overgrowth of the villi within the joint. This affection may be mono- or polyarticular, and spreads, if at all, only slowly from joint to joint. As a rule, there is no fever, the joints assuming a swollen, waxy, shining appearance. In cases of long standing the joints become more or less ankylosed and deformities result.

ARTHRITIS DEFORMANS sometimes occurs before puberty, but it is rare. The teeth should be carefully searched for a possible focus of infection. Any focus of suppuration should be suspected. The characteristic features are joint deformity, pain, and disability. The disease affects many joints at

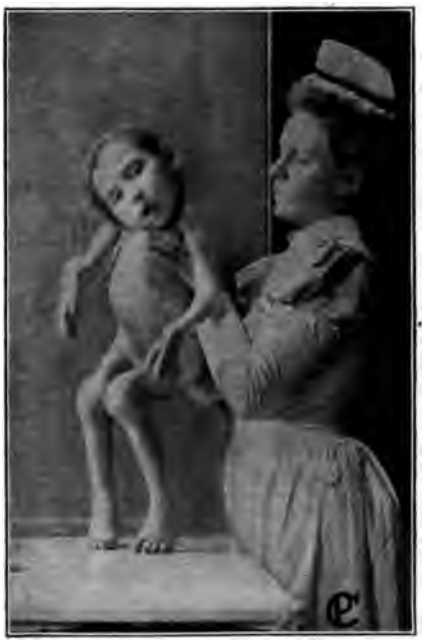

FIG. 83.— Arthritis deformans in an eight-year-old girl.

one time and progressively involves others. The joints of the fingers are, as a rule, the first to be affected. Later there is seen much atrophy of the soft parts and even of the bones themselves. These chronic forms must be differentiated from tuberculous and syphilitic arthritides. Syphilitic affections usually appear late in neglected cases and fortunately are rarely seen in children. There is an effusion of serofibrinous fluid into the joint, accompanied by little or no constitutional symptoms. The history, and sometimes a specific inflammation of the cornea, may definitely determine the diagnosis.

TUBERCULOUS ARTHRITIS is accompanied by bone changes, and the X-ray should be employed to clear up a case that offers any difficulties in diagnosis. The tuberculin reaction, inoculation experiments in animals, or the tuberculin tests, may also be employed as diagnostic aids.

Treatment.— In the early stages, if there is any pain, rest in splints will afford much relief. As pointed out by Taylor, the diet should be nutritious and not restricted. Any focus of infection, as in the teeth, *e.g.*, must be removed. Later massage and careful passive movements combined with baths sometimes lead to success. Orthopedic appliances and surgical intervention are often necessary to correct resulting deformities.

STILL'S DISEASE.— This is a polyarthritis occurring in childhood which is as yet little understood. Clinically, it seems related to certain forms of chronic sepsis.

There develops an enlargement and partial ankylosis of the joint with some temperature of an irregular type associated with splenic hypertrophy, and quite general enlargement of the liver and lymphatic glands.

As distinguished from the other rheumatoids, the disease does not tend to destructive changes in the joints, and in fact seems to be self-limited.

Malaria.

(*Paludism.*)

Malaria is an infectious disease caused by the hemacytozoon of Laveran, and characterized by a periodic intermittent or remittent fever.

Etiology.— The parasite is carried through the anopheles mosquito, which is distinguished from the common mosquito or culex by the following characteristics.

ANOPHELES.	CULEX.
1. Two large palpi on side of proboscis.	1. Small palpi.
2. Mottled wings.	2. No spots on wings.
3. Body held at an angle 45° or more,	3. Body held parallel. Posterior legs often crossed over back.
4. More often found in the country.	4. More often found in cities.

The parasite of Laveran occurs in three forms: the tertian, quartan, and estivoautumnal.

In the fall of the year the greater number of cases are seen. Regions in which much marsh land is found are favorable places for the breeding of the anopheles, and in these localities malaria is naturally more prevalent.

Pathology.— The tertian variety develops in the human organism in forty-eight hours. At first there is seen a small ovoid particle within a red blood-cell. Pigmentation appears as development progresses around the periphery of the parasite. Ameboid movements may be noted. The hemoglobin of the red cell appears to be destroyed by the parasite. Segmentation now takes place, creating the spores which are freed in the blood stream and are ready to attack new red cells, and then pass through a similar cycle of development.

The quartan type completes its development in seventy-two hours, producing the characteristic paroxysms on the fourth day, instead of on the third, as in the tertian type.

It may be differentiated from the tertian by the lack of movement on the third day, and by the peculiar yellowish-green color of the cell, and by the rosette appearance on the fourth day.

The estivoautumnal variety takes twenty-four to forty-eight hours to complete its cycle, and cresentic forms appear after a week of development. The parasite is sparsely pigmented and smaller in size. The gametocytes or sexually differentiated types develop only in the intermediate host. Sporozoids develop in the host or mosquito, and through its salivary glands infect the bitten individual, where they develop into parasites and pass through one of the cycles as just described.

In mild cases of malaria little alteration in the body structures may be found besides an enlarged spleen and changes in the blood. Malaria is rarely fatal in infants and children.

In the pernicious forms both the liver and spleen are enlarged. In chronic malaria the spleen and sometimes the liver become hard and deeply pigmented.

Symptomatology.— In infants (in whom it is quite rare) and in younger children the symptoms are irregular in form and the clinical diagnosis is often obscure. In older children the typical adult type is seen, presenting little or no difficulty in diagnosis. A distinct chill or chilly sensations, and sometimes a convulsion, may usher in an attack. Chills are not observed in infants.

The child has been listless for several days or complains of being tired, stretches, and yawns. The extremities are cold, and the child seeks its bed for warmth.

The common type in infants and younger children results from a double infection with the tertian parasite, producing the so-called quotidian fever. The temperature is high, with a corresponding pulse rate.

The estivoautumnal type is not often met with; it produces a very irregular form of fever with or without a definite paroxysm. The fever may be intermittent or even remittent in type; that is, a continuous fever with small excursions and no drop to the normal.

In older children, as has been said above, the adult type is simulated. The period of chill is followed by the stage of fever and more or less perspiration. The temperature reaches 104° or 105° F. and is accompanied by headache, often vomiting and extreme thirst. A normal or subnormal temperature follows after the period of high fever. The succeeding day a robust child may be willing to go about and play as usual.

In the cities we see a subacute variety, usually in children, about the fifth year of age. They are brought because they are on different days listless, pale, and without ambition. The physical examination often shows an enlarged spleen and characteristic blood changes. True chills are not experienced nor does one obtain a history of fever followed by perspiration.

Malarial cachexia and the pernicious forms of malaria are rarely seen among children in the United States, at least in the North. In the cachectic or chronic type the spleen is uniformly large and firm, sometimes extending to the crest of the ilium. In these cases the liver is apt to be enlarged. The child is extremely anemic, has a greenish-yellow tinge, and a poor complexion. Loss of appetite and constipation are commonly found. The urine is highly colored and may contain casts and blood.

Differential Diagnosis.— Malaria must be differentiated from typhoid, secondary anemia, Banti's disease, and certain forms of nephritis. Repeated examinations of a fresh or stained specimen of blood, or both, should be made for evidences of the malarial organism.

The therapeutic test with quinin may be made in suspected cases in which a blood examination is not feasible. A 20 per cent. increase in the large mononuclear leucocytes usually means a protozoal infection.

The uniformly enlarged spleen found in malaria is a diagnostic feature of great importance. The spleen is said to be enlarged in a child when it can be felt. The Widal test and a differential blood count will often assist in fixing the diagnosis when a careful physical examination, including the ears, has been made to exclude other conditions. Pyelitis is excluded by a urinary examination.

Treatment. Prophylactic.— The physician should be acquainted with the genus of mosquito in his locality. If the anopheles are present he should insist upon the authorities taking all possible measures to drain the swampy areas. The children's cribs should be closely screened. Water barrels and similar tanks must be protected by screens to prevent the development of larvæ. The latter may be killed by the use of crude petroleum floated over infested pools.

Therapeutic.— An initial purge with calomel is recommended. The early and continued use of quinin until a cure is effected is essential in any of the forms above mentioned. Relatively larger doses may be given to children than to adults. For infants and younger children, the soluble bisulphate is recommended. Its bitter taste is often less objected to by younger children than by their elders. The syrup of yerba santa best disguises its bitter taste if any addition is necessary. Euquinin and tannate of quinin are tasteless preparations which may be given in mild cases, and when given should be prescribed in doses double that of the sulphate. The sulphate of quinin in half-grain doses may be made more palatable by the use of chocolate in tablets or lozenges.

The year-old child may be given one grain of the sulphate or bisulphate every three hours. A child of five years, three grains every four hours. Larger doses may be given on well days, and decreased or omitted during the paroxysms. Where the stomach is irritable and the quinin not retained, rectal injections of the bisulphate may be made, preferably in a mucilaginous suspension.

Suppositories of quinin are not very satisfactory for continued usage. The hydrochlorate or bimuriate of quinin in cocoa-butter should be used for this purpose. The hypodermatic administration of quinin in children in this country is unnecessary and uncalled for.

The chill is combated with a number of hot-water bottles, a hot pack or a hot bath. The oncoming fever is allayed with alcohol sponging and cool drinks in small quantity at frequent intervals.

Quinin should be administered for at least a week following the last symptoms of malaria. The elixir of iron, quinin and strychnia will do much to combat the resulting anemia, a half-dram three times a day after meals to a five-year-old child. Fowler's solution or Warburg's tincture are useful in the long-standing cases.

Erysipelas.

This is a constitutional infectious disease presenting a diffuse, rapidly spreading inflammation of the skin and subcutaneous connective tissue, and occasionally of the mucous membranes.

Etiology.— No specific organism has been found in erysipelas, but a streptococcus is thought to be usually the active cause. It may occur in connection with a septic condition of the mother during or shortly after birth, or from contamination in lying-in hospitals or midwives. The virus enters the system through an abrasion of the skin or mucous membrane.

Symptomatology.— The disease is more apt to occur during infancy than childhood, and the earlier it appears after birth the more serious will be its effects. In robust infants the inflamed skin will present a deep-red color, while in feebler babies it will be lighter, presenting more of a pinkish appearance. The deeper tissues may likewise be involved in a phlegmonous inflammation in severe cases, and there may also be edema and finally some desquamation. In the newly-born the disease is apt to be contracted from some septic condition of the mother. It may then start at the umbilicus, in the genital region, or from some point of abrasion consequent to the delivery. Where the umbilicus is affected, the disease is apt to extend

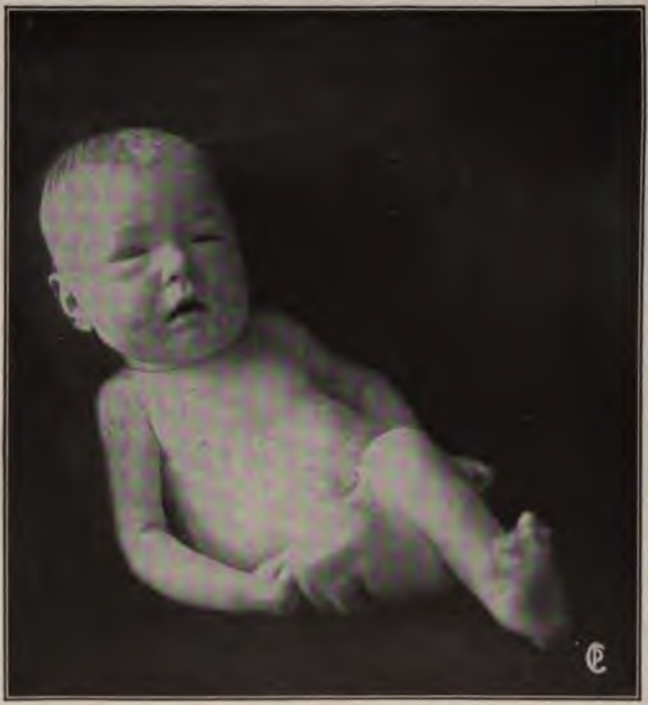

FIG. 84.— Erysipelas, which began on the face and spread over the body.

inward, producing a peritonitis. In other cases pneumonia or empyema may ensue and hasten the fatal ending. In older infants the disease begins on some abrasion of the skin, frequently around the genital organs, but sometimes on the trunk, arms, or legs. It is not so apt as in adults to attack the face and scalp. The cutaneous redness and subcutaneous infiltration spread rapidly, but with a sharp line of demarcation between the diseased and healthy skin. The affected part is usually hot to the touch. The constitutional symptoms are commonly severe, with evidences of prostration. The result of the pricking or burning pain is seen in great restlessness, disturbed sleep, and occasionally convulsions. The fever is irregular and high up to 105° F. where much of the skin is involved. The pulse is usually rapid and feeble. There may be evidence of gastroenteric irritation, shown either by vomiting or diarrhea. In fatal cases death usually results from exhaustion or from some complicating disease, such as peritonitis or pneumonia. Abscesses and even sloughing of tissues may accompany severe and deep-seated erysipelas. The tendency to spread is shown in some cases by the whole surface of the body becoming involved. There is frequently in infants a recurrence of the inflammation involving the same surfaces as were originally attacked. The disease may last from one to three or four weeks.

Prognosis.—The prognosis will vary with the age of the infant and the extent of the inflammation. It is very fatal during the first month, and from that period up to the sixth month the outlook will be uncertain. After six months the prognosis is good. Constitutional symptoms are usually less severe when the arms and legs are involved than when the disease affects the region around the umbilicus or the neck and head. If the inflammation is superfical and spreads slowly, the prognosis is naturally more favorable than where it spreads rapidly and is more deep-seated with the character of a cellulitis.

Treatment.— While the disease cannot be aborted, every effort must be made to sustain the strength of the infant by simple, nourishing diet. If the mother is septic, the baby must be removed from the breast, but otherwise maternal feeding offers the best chance for recovery. In bottle babies it may be necessary to weaken the formula or to peptonize when there are evidences of digestive disturbances. We believe that tincture of the chlorid of iron is beneficial, and an infant of a year old may be given three or four drops, well diluted, every three hours. As it is an asthenic disease, it is often necessary to stimulate, giving strychnin or whiskey when the pulse is weak. Cooling and antiseptic applications may be applied to the skin and such as the liq. alumini acetatis N. F. or a 50 per cent. solution of magnesium sulphate. Ichthyol, a dram to the ounce, may be employed to relieve itching and burning and act as a local antiseptic. Infants with erysipelas should be isolated, particularly when near surgical cases or those apt to have any abrasion of the skin or mucous membranes. Their clothing and bedding should be disinfected at the termination of the disease.

The polyvalent streptococcic serum may be tried in desperate cases, but our experience with its use prevents its recommendation as a general remedial measure.

Disinfection.

Disinfection in the light of our recent conception of the transmission of infectious diseases no longer plays a prominent part. Sunlight and fresh air are alone depended upon for the disinfection of the room and for such contents as cannot be burned. The contagion is carried not by the air, but by the secretions from the body cavities, or by insects. Except when there is close contact with the patient the danger of transmission is comparatively slight. The wearing of cap, gown and rubber gloves amply protects the physician in this regard.

The Sick-room in Infectious Diseases.— Infection may be carried in the sputum, in the throat secretions, in discharges from the nose and ear, in skin débris, in exudations, in conjunctival or abscess discharges, and in the urine or stools. The sick-room should be stripped of superfluous fittings; it should be in a remote part of the house, and preferably on the top floor. A large room with plenty of ventilation and sunshine and with an open fire should if possible be selected. A gown and hood should be provided for the physician and hung in a separate outside closet. All clothing worn by the attendants in the sick-room should be washable, and a complete change should be made before mingling with the members of the household. When changes in linen are made for the patient or attendant the articles are to be rolled up in a bundle and put to soak for twenty-four hours in a carbolic (1 to 20) solution before being sent to the laundry, where they are to be washed separately.

When it is known that anyone has been exposed to an infectious disease, they should be isolated as soon as possible and given a bichlorid of mercury (1-5,000) bath and a complete change of clothing. Such individuals should be kept under close observation until the incubation period for that particular disease has passed.

Scrupulous cleanliness with regard to the excreta and discharges of the patient is imperative. Soft Japanese paper napkins are most convenient for wiping nose and throat discharges. They must be burned at once after use. Carbolic vaselin rubbed over the skin of patients suffering from variola, varicella and scarlet fever prevents the pus, exudations, and epithelial débris from drying and being scattered. Urine and stools should be treated with equal volumes of carbolic acid solution (1 to 20), bichlorid of mercury (1 to 1,000) or chlorid of lime (1 to 50), and allowed to stand three or four hours before disposing of them. Large masses in stools should be broken up to insure thorough disinfection. In cases in which the throat is involved, frequent gargles of chlorin water, potassium permanganate (1 to 300), formalin 1 per cent. or peroxid of hydrogen reduce the number of bacteria in the expired air besides having a beneficial effect on the patient. Dishes and utensils used by a patient are to be placed for an hour in a large receptacle containing carbolic solution (1 to 20) and then boiled or scalded. Milk bottles should not be returned to the dairy but destroyed.

The remains of one dying of an infectious disease should be embalmed with a fluid which will stand the bacteriological test. Close all external openings of the body with absorbent cotton and give a thorough sponge bath (including the hair) using carbolic solution (1 to 20) or bichlorid of mercury (1 to 1,000).

Carbolic acid in a one to twenty or 5 per cent. solution will rapidly destroy non-sporing bacteria, although their spores are not destroyed for several weeks. Albumin, if present, impairs its efficiency only slightly. Cresol, a derivative of carbolic acid, is also an excellent disinfectant.

Calx Chlorata (chlorid of lime) depends upon the formation of hypochlorous acid for its efficiency. The alkalinity of the lime present renders a solution of this agent most valuable for disinfecting albuminous material, as it first disintegrates and then disinfects. For practical purposes, no other chemical can compare with this agent for the disinfection of sputum and feces. If equal parts of a dilute solution of acetic acid (1.25 per cent.) or vinegar and a saturated solution of chlorid of lime are mixed together this agent will destroy spores in one minute. Chlorid of lime rapidly deteriorates if left uncovered, due to liberation of the hypochlorous acid. Herein lies the greatest objection to this agent, for much of the chemicals sold in the shops is too old to be efficient.

CHAPTER XXII.

TUBERCULOSIS.

Tuberculosis is an infective fever caused by the toxins of the tubercle bacillus, and characterized by the formation of heteroneoplasms called tubercles. Any organ or part of the body may be attacked. The disease may be confined to certain organs or may be generalized, occurring at the same time in many parts of the body.

Etiology.— The tubercle bacillus upon which tuberculosis in any or all of its manifestations depends, is a rod-shaped, facultative, colorless bacillus, slightly bent and having rounded ends. In size it is about one-fourth to one-half the diameter of a red blood-cell. It is especially distinguishable for its staining properties. It strongly resists decolorization after having been stained with acid dyes.

There are several varieties of the bacillus. We are mainly concerned here with the human and bovine types. The controversy regarding these types is not yet settled, but the distinction still seems to be a strong one between these forms.

The bovine type of bacillus differs somewhat in form, being more irregular, thicker or oval in shape with blunted ends. The types may also be differentiated by cultural methods. This method, however, is suitable only for a laboratory specialist. About 10 per cent. of all tuberculosis in early life has been demonstrated to be caused by the bovine type. Pulmonary forms are rarely of bovine origin.

The bacillus is easily destroyed by sunlight or heat, either dry or moist, but is not affected by low temperatures.

The disease occurs at all ages — fetal tuberculosis has been recorded (Jacobi, Wollstein, and others).

The invading microorganism gains entrance to the body through three main channels, given in the order of their relative importance; through the respiratory tract, through the intestinal tract, and through wounds and abrasions of the skin. Infants and children are infected mainly through the respiratory tract.

Hereditary predisposition is still the subject of argument, but the position held by Adami appeals to us. He believes that two possibilities may result from parental tuberculosis: the offspring may become especially susceptible if the germinal cells become weakened by progressive disease, or if the disease is well resisted the child may acquire an increased resistance to the disease.

Parental diseases, nutritional faults and developmental defects in the parents often leave the offspring with a lowered resistance to tuberculosis.

A child with poor muscular development, with a flat and narrow chest and small abdomen is considered to have a disposition to tuberculosis; we can add to this class children who are mouth-breathers and have defects of the nose and mouth.

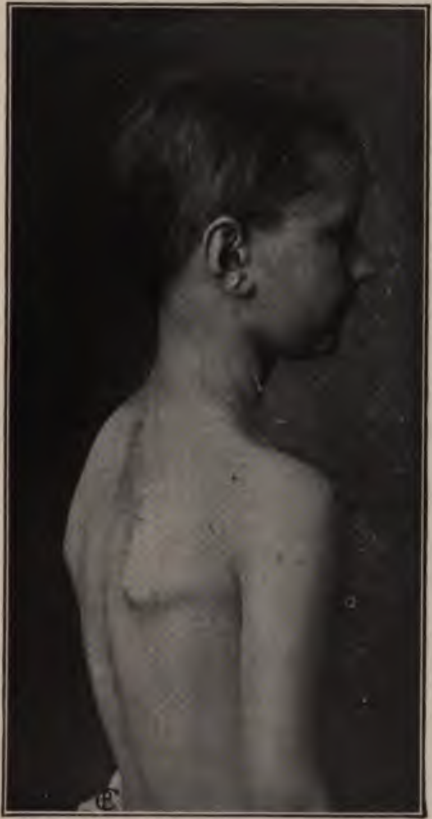

FIG. 85.— Conformation of the chest commonly seen in tuberculous children.

In childhood there is little resistance to the disease; the glands, meninges, bones, joints, and lungs are easily invaded and are believed by v. Behring often to remain latent and develop in later life into the pulmonary form.

Again, in childhood the disease is not apt to develop at the site of infection as in adults, but extends to other tissues and forms tubercles there. The entity known as scrofula is still acceptable to Continental Europe; but in America the weight of opinion is that scrofula indicates tuberculosis, and we believe with Baldwin that it can be used to mean an important predisposition to pulmonary tuberculosis, which he says is associated with it in 25 per cent. of all cases. Measles, whooping cough, diphtheria, pneumonia, influenza and, in a lesser degree, scarlet fever, tonsillitis, and variola are often the precursors of tuberculosis, because of their effect on the mucous membranes and lymph glands accompanied by the lowered resistance of the convalescent child.

Rickets, too, is a disease favoring tuberculous infection when accompanied by defective nutrition and thoracic deformities. Finally, gastro-intestinal diseases from their destructive action on the mucous membranes lead sometimes to open infection and probably often to the latent form.

The children of poor parents in unsanitary surroundings, whether in city or even in the country, are prone to the infection, which they may receive from the following sources: Human sputum, through food objects or dust, urine or feces on soiled clothing or beds, and milk of tuberculous cattle. Milk as a food, however, may be indirectly contaminated by dust or infected containers. Infants at the breast have been infected by their mother's soiled hands or her kisses.

Cornet reports infection by midwives who blew into the mouths of the infants to start up respiration.

Children are intimately connected with the fact that tuberculosis is a "family disease"— 40 to 60 per cent. disclosing a history of other cases in the household; and this close contact is the great infecting method: the nursling infected by close touch with its mother, the creeping infant on the contaminated floor carrying all things to its mouth, the school boy trading toys — all show at a glance the numberless ways in which children may become tuberculous.

Tuberculous Adenitis.

This may be confined to certain groups of lymph-glands, as the cervical or bronchial, or there may be an involvement of all, or nearly all, the lymph nodes of the body.

The glands become infected by access of tubercle bacilli through the lymph channels. The point of entrance may have been only a slight abrasion or some form of dermatitis. The glands may also become infected from tuberculous lesions in their vicinity.

A cross section of a tuberculous gland shows the parenchyma swollen and hyperplastic, grayish in color, containing nodules varying in size, some of which are undergoing caseation. If the latter process is advanced, the gland is soft and the tubercles are found at the margins only. The glands most commonly involved are those at the root of the lung. The mesenteric lymph nodes are frequently infected in children and are the usual accompaniment of the miliary and generalized forms.

Symptomatology.— The subjects of tuberculous adenitis are, as a rule, anemic children of the blond type. The appetite is capricious or lost, the weight decreases, and at this time the parent may notice an enlargement of a gland or group of glands. They are not painful to the touch, growing slowly but steadily; sometimes there is a rise of fever, especially in the evening. Physical examination may show tuberculous lesions elsewhere in the body. If the cervical lymph nodes are involved the tumors are at first found in relation with the sternocleido mastoid muscle. At first they are freely movable, but the chain of glands increasing, they soon adhere one to the other, forming sometimes large masses which may even cause mechanical obstruction. Bilateral involvment is not uncommon. The overlying skin now becomes attached to the mass below, and when the glands caseate the skin is thickened and loses its normal color, often becoming purplish-red. If there is no surgical intervention the glands rupture through the overlying skin or dissect the fascial planes; the abscess may discharge at some distant point. Often several long-persisting fistulous tracts result.

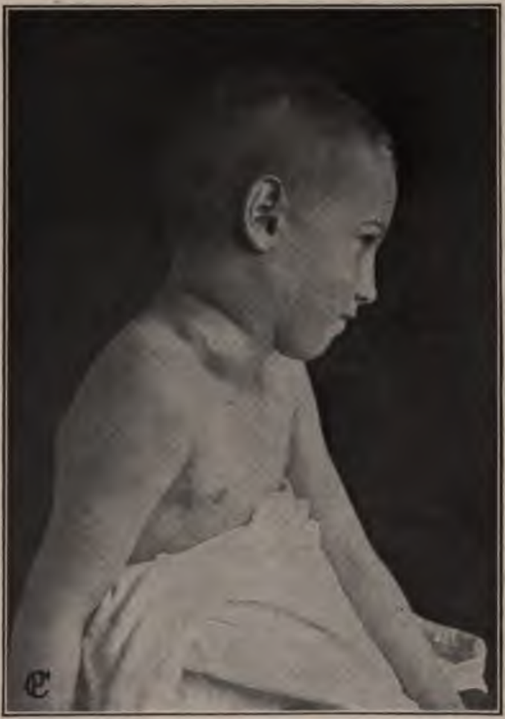

FIG. 86.—Tuberculous adenitis of the cervical and axillary glands.

In the generalized form, the cervical, inguinal, and axillary glands show the greatest and earliest involvement. The children are markedly anemic and often have a variable amount of temperature. Wasting slowly takes place and new foci are found developing in other parts of the body. Bimanual rectal examination will show the involvment of the retroperitoneal and mesenteric lymph nodes.

When the bronchial lymph nodes are large, pressure symptoms may occur, causing a paroxysmal cough with breathing signs of bronchial asthma. In advanced cases dyspnea is produced on slight exertion. Sometimes dullness is obtained on percussion over the manubrium which extends over a varying area. This is usually accompanied by tubular breathing on the left side.

Diagnosis.— The diagnosis of tuberculous adenitis is based upon the slow course and the absence of active inflammatory changes, such as heat or pain on palpation. Simple adenitis can usually be traced to some source of infection, as an eczematous area, caries of the teeth, etc. These glands subside when the focus of irritation is removed. If there are evidences of tuberculosis in other structures, tuberculous adenitis may be suspected.

The tuberculin tests (p. 56) may be used to corroborate the diagnosis. Syphilitic glands are distinguished by their location. The epitrochlear glands show simultaneous enlargement with other syphilitic manifestations in different parts of the body.

Lymphosarcoma is sometimes confounded with generalized tuberculous adenitis. This disease usually primarily involves the retroperitoneal glands or those within the mediastinum. The growth here is rapid, invading neighboring structures, and often producing serious symptoms before the true nature of the disease is suspected.

Course and Prognosis.— It is often difficult to predict the end-result of a tuberculous adenitis. The prognosis should always be considered seriously as a focus which may at any time spread the disease to the lungs or other structures.

If the subject is young and can be placed in favorable surroundings, restitution to the normal may take place. Even degenerated glands with fistulous tracts may eventually terminate in a cure under proper care.

Treatment.— Immediate steps should be taken just as soon as the diagnosis is certain to remove the child, if possible, to the seashore, where it should live in the sunshine and fresh air. The diet should be as nourishing as possible, consisting principally of milk, eggs, cereals, and rare meats. Cod-liver oil, if well borne, should be given twice a day, after the midday and evening meal. If this is not acceptable, good results can be obtained by increasing the quantity of butter, cream, or top milks. Sometimes olive oil in two-dram doses twice a day can be substituted if the child prefers it.

Surgical removal of the glands may be considered when they are superficial and movable. The dissection is often long, tedious, and dangerous when the glands are deep and are in proximity to the great vessels. General miliary tuberculosis may follow the removal of glands when a clean dissection is impossible. However, it is sometimes necessary to resort to removal for the cosmetic effect or for the relief of pressure symptoms. Good results have been obtained in a number of cases from radiotherapy and it would seem best to counsel non-interference until these measures have been given a fair trial.

Thoracic Tuberculosis.

It is only within recent years that the frequency of pulmonary tuberculosis in early life has been correctly appreciated. From a study of all necropsies in children under fifteen years of age, Harbitz at Christiana found tuberculosis in 42.5 per cent. of all. Denning shows that 70 per cent. of all infants and children who die from tuberculosis show tuberculous changes in their lungs. Pediatrists incline toward the respiratory tracts, while pathologists lean toward the alimentary tract as the principal portal of entry; the controversy, with much to be said on both sides, concerns us in regard to prophylactic measures to be spoken of below.

Tuberculosis in early life increases regularly with the age. It is rare in the first three months of life, and then almost, month by month, the frequency increases steadily. The figures of Hamburger and Sluka, obtained from 2,557 necropsies on tuberculous children under fifteen years, report that tuberculosis was the direct cause of death in all those under six months of age; that it caused death in 75 per cent. of those in the second year of life, and in the children over two years old it became more infrequently the cause of death. Necropsy findings, however, are not absolute indications of the prevalence of tuberculosis in early life since virulent bacteria may be present without producing demonstrable lesions.

Tuberculosis in early life is a disease of the lymph nodes, but after the tenth year the pulmonary form is more prevalent; and again after adolescence the characteristics do not differ greatly from those seen in adults.

Pulmonary involvement may occur by direct infection from caseous tuberculous glands through the blood stream or by emboli, and through the lymph channels from tuberculous lymph nodes, bones, or pleura.

Pulmonary Lesions.— The pathological anatomy does not differ greatly from that seen in adult life, but the areas involved are always greater; in other words, the disease is more diffuse. This is especailly true in the first two years of life.

In tuberculous bronchopneumonia, which is the predominating and fatal form, there occur large caseating deposits usually to some extent in both lungs. When a mixed infection occurs the nodules are very apt to degenerate. True cavities of any size, however, are rarely seen in early life. The glands at the root of the lung are invariably enlarged and often soft and caseating. The pleura is almost always involved.

IN MILIARY TUBERCULOSIS of the lungs, the tubercles are scattered over the surface of the lung, and in some cases have been found in the parenchyma. Patches of bronchopneumonia and congestion with edema may be present, or the lung may appear quite normal except for the superficial tubercles.

Diagnosis.— The diagnosis of incipient tuberculosis of the lungs differs considerably in early life from that of adults. In the first place the apices of the lungs are not most frequently involved; it is the lower lobes or the lower part of the upper lobe that is primarily involved, which may often be accounted for by the proximity of the bronchial glands. The physical signs often do not differ from those obtained in bronchitis and bronchopneumonia, and the younger the child the more diffuse will be the disease. Therefore it is necessary to employ every means at our command to perfect the diagnosis. The physical signs with the symptoms and the history then become of value.

In obtaining a history in suspected children, it is especially important to ascertain if the child has been in intimate or close contact with a tuberculous patient, or if there has been a slow convalescence from any of the infectious diseases, especially measles and pertussis.

Gibson has called attention to a venous dilatation occurring over the chest, neck, and shoulders of children, and tending to converge above the sternum. This, when present, is a valuable sign, and it is probably due to tuberculous bronchial lymph nodes. If we could safely and surely diagnosticate enlarged bronchial lymph nodes we would have valuable confirmatory evidence. D'Espine says he has a reliable method in voice auscultation; in the healthy child the tracheal tone stops at the seventh cervical spine, but is heard below this point in pathological conditions. Later on, dullness over the seventh cervical or first dorsal vertebra with intrascapular dullness may be elicited. Cavity formation is rarely recognized under three years of age, while after eight the signs will simulate those in the adult. Expectoration is the exception in children, while under seven years hemoptysis rarely occurs and practically is never observed in those below five years old.

Three groups of thoracic tuberculosis may be distinguished in children; the glandular, tracheobronchial, and the pulmonary. The symptoms are never so characteristic as in the adult; as a rule, there is a rapid development of symptoms. If we encounter steady emaciation, progressive muscular weakness, an irregular temperature with a fairly constant evening rise, enlarged superficial glands, with a persistent dry cough, we are justified in utilizing diagnostic aids to confirm the diagnosis.

In adults, a diagnosis may sometimes be made by physical signs before the tubercle bacilli are found in the sputum. In infants and young children, however, we are pleased if we obtain any sputum to examine, and must be prepared to make diligent search for the bacillus. Among the methods used with success in obtaining sputum from infants is wrapping a piece of gauze on the end of the finger and irritating the epiglottis thus catching the sputum. We use an ordinary laryngeal swab wrapped with cotton which is quite effective and does no damage to the delicate mucous membranes. The sputum being often swallowed, the vomitus or the feces will also contain the bacilli, but the search is more arduous.

Ogilvy and Coffin, as a result of their studies, believe that the difficulty and tedious technic of estimating the opsonic index and the wide variation obtained by various observers make this procedure impracticable for diagnosis.

Injections of tuberculin may be used diagnostically as a last resort if it is imperative that a definite diagnosis be made. In children the reaction is more favorable than in adults. Its use, however, is limited to those cases without temperature. The dose which is safe in children is one ten-thousandth of a c.c. of Koch's old tuberculin, one three thousandths being the maximum dose.

The agglutination and the heated serum tests have been tried, and the reports are quite uniformly against their practical value.

The von Pirquet skin test (see p. 56) has superseded all the other tests for reliability.

Pulmonary Tuberculosis.

Acute and Subacute Forms.— Etiology.— Mainly through the bronchial lymph nodes, the infection is carried to the lungs of infants and children; the lung may be more directly affected, however, through the impoverished mucous membrane following certain infectious diseases. Tuberculosis in other structures predisposes to lung infection. The generalized process in the lungs is part, and usually the termination, of a miliary tuberculosis, while the localized process is most often found close to the bronchial glands.

Acute tuberculous bronchopneumonia in infants and young children does not markedly differ in its physical signs from the simple bronchopneumonia, but the period of illness sometimes lasting from two to six weeks must be suggestive.

The fever is generally lower and with smaller excursions than in the ordinary form until the toxemia itself produces high evening rises up to 103° or 104° F. Loss of weight is slow but progressive. The appetite is capricious, the patient is irritable, easily tired, and at times somnolent; the bowels are, as a rule, constipated, although diarrhea may periodically appear.

The fever causes restlessness at night and in the morning. The body and clothing may show that sweating has taken place. The cough is paroxysmal in character, and is apt to be more frequent upon awakening. As the disease progresses, circulatory changes are evidenced by cyanosis in the finger-tips and lips. Dyspnea is easily caused by slight exertion or coughing. Hemoptysis is exceedingly rare in children. If death does not supervene, the affection may appear elsewhere, as in the brain, intestinal tract, or in the glandular structures.

Physical Signs — These may not differ from the ordinary bronchopneumonic type of the disease. Occasionally only are there signs of cavity formation, or well-developed signs of bronchial and peritracheal glandular hypertrophy. The latter signs, if obtainable, are of distinct diagnostic importance.

The examination of the sputum, obtained with a laryngeal swab or from the stomach contents, urine, and feces, may reveal the presence of tubercle bacilli.

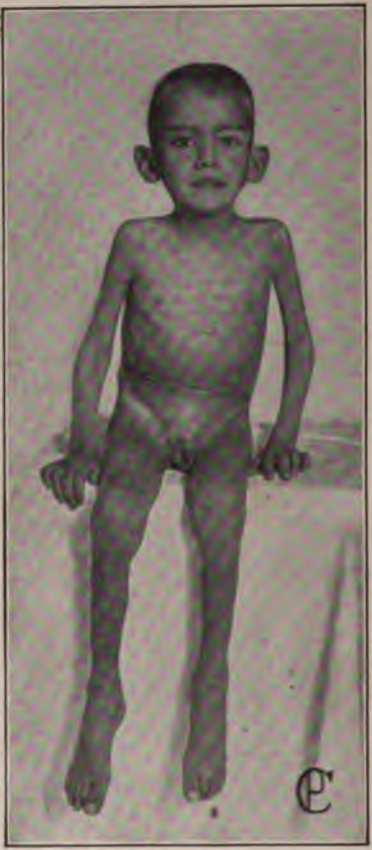

FIG. 87.—Chronic pulmonary tuberculosis in a five-year-old boy.

Chronic Pulmonary Tuberculosis.

This form is rarely seen under five years of age. In the cases that have come under our observation, the tuberculous process was extremely diffuse in character. The physical signs do not markedly differ from those of the adult type.

Progressive loss of weight, night-sweats, extreme anemia with high leukocytosis, and frequent attacks of gastroenteritis are the symptoms which finally precede death.

At any age the pleura may become involved in the tuberculous process, and an empyema result. The pus in these cases is thinner and more watery in consistency, and only rarely can the tubercle bacilli be isolated. These cases do not tend to recovery; further lung involvment takes place, and death often results with meningeal symptoms.

Course.— The course of the disease in early life varies with the form. There is a latent form in which the characteristic features are irregular fever, rapid emaciation, and late pulmonary signs. The affection runs a speedy course, terminating sometimes in a few days to a fortnight. The child with the bronchopnuemonic or the more usual variety may live several weeks. In exceptional cases the patient has lived six months. The chronic form, under favorable circumstances, such as the modern sanatorium treatment gives a more favorable prognosis; that is, there is a tendency toward arrest of the process.

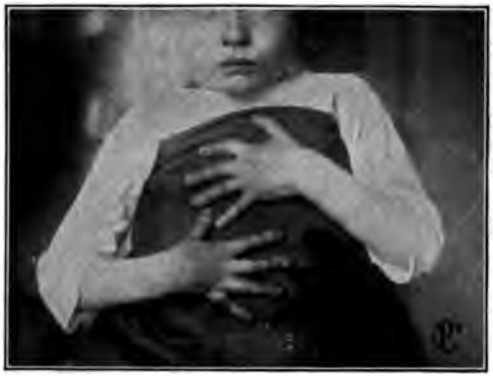

FIG. 88.— Clubbed fingers in chronic pulmonary tuberculosis.

Acute Miliary Tuberculosis.

This is an acute general infection with tubercle bacilli, occurring at any period of childhood. As a rule, it is secondary to some primary focus in the body, which may have been dormant for some time.

Etiology.— Measles, whooping-cough, and tuberculous lymph nodes are the exciting causes. The disease occurs quite commonly in early life, especially the meningeal form or tuberculous meningitis. McCrae had forty-three cases of generalized miliary tuberculosis in 417 autopsies on tuberculous individuals; among these were fifty-five children. The meninges were involved in twenty-one, and the thoracic lymph nodes in thirty-three cases.

Two forms of the disease are recognized — the general and local — based upon the symptoms.

In the *general form* the symptoms in the early stages are such as to simulate beginning typhoid. There is irregular fever with no characteristic curve, malaise, loss of appetite, slow emaciation at first, becoming more marked as the disease progresses. The pulse is increased out of proportion to the temperature. Rapid, shallow breathing is later followed by the Cheyne-Stokes type as the disease progresses, or if meningeal symptoms intervene. Vomiting is often an early symptom.

The spleen is enlarged almost invariably and the liver, too, is often increased in size. A disturbing slight cough is generally present. The urine contains traces of albumin and hyalin casts, and occasionally tubercle bacilli can be found. Inoculation tests from the blood may confirm the diagnosis. The younger the child the more often does the meningeal form bring on a rapid termination. Delirium, stupor, and coma denote cerebral involvment. The usual course is from three to six weeks. The prognosis invariably is hopeless.

Differential Diagnosis.— The Widal test and the more typical temperature curve, with the characteristic eruption, plus the relative increase in the mononuclear elements in typhoid, must be depended upon to distinguish this form of tuberculosis from typhoid, although this is sometimes extremely difficult. In miliary tuberculosis, besides the tuberculin test, an ocular examination may, especially in the later stages, show tubercles in the choroid, or fluid withdrawn from the spinal canal may show tubercle bacilli.

Local Manifestations.— Miliary involvment of the lungs usually occurs after measles or whooping-cough, or is secondary to a bronchopneumonic process. The physical signs offer no help in differentiation. The diagnosis in children is extremely difficult until the disease has progressed to some other structure, as the brain, when more characteristic symptoms are obtainable.

Tuberculous Meningitis.

The tubercle bacilli spread from some focus of infection through the lymph channels or blood current to the meninges, and usually form an eruption of miliary tubercles at the base of the brain, spreading up to the vessels in the fissure of Sylvius. An inflammatory exudate is almost invariably found in the space between the optic chasm and the peduncles.

The exudate is yellowish-green in color, tenacious and adherent to the pia mater. The ventricles are more or less distended with fluid, in some instances forming a distinct internal hydrocephalus. The ependyma, if carefully removed, is found to be rough, edematous, and may be infiltrated with tubercles. The pia mater is injected with a serofibrinous or seropurulent infiltrate. Not infrequently the tubercles are seen in the choroid plexus. Occasionally there is only a slight amount of exudate, and the infection is found to be localized in the form of one or more nodules, some the size of hickory-nuts, which are known as solitary tubercles of the brain.

Etiology.— Tuberculous lymph nodes which have become diseased as a result of the acute infectious diseases, especially pertussis and measles, play the principal rôle in the causation. A latent tuberculous focus may set free the tubercle bacilli into the blood stream. A tuberculous osteitis or an infection in the uropoietic system may be responsible for the meningeal involvement. A number of cases seem to be traceable to a chronic otitis media. Unsanitary surroundings, especially in a tuberculous environment, predispose to the disease. On the other hand, it occurs among the well-to-do, and may attack a child that has been considered exceptionally healthy. It commonly occurs below the age of five years. Infants of five months have been reported who have died of the disease. (Rilliet.) In Koplik's series of fifty-two cases, eleven were less than one year old, while the average age was slightly over four years.

Symptomatology.— It is impossible to give a typical description of the symptoms of this disease, so varied are its manifestations.

The prodromal symptoms usually come on gradually and insidiously. A previously healthy child becomes irritable, morose, and refuses to play. Lassitude, coated tongue, loss of appetite and occasional vomiting are, as a rule, attributed to digestive disturbances. If the child is old enough, headache, dull in character, is complained of. Progressively the symptoms grow more marked until signs of cerebral irritation appear. Occasionally the onset is abrupt with fever, vomiting, and pressure symptoms.

The diagnosis may not be suspected until the child refuses to leave the bed. The pulse rate in infants is usually increased; in older children it may be irregular in character. Vomiting occurs irregularly and with no regard to the food ingested. The temperature is not high, rarely over 101° F., and may be normal during the morning hours. The mentality is dulled and the child is aroused with difficulty. The food is taken without protest or interest. Infants may show increased tension by a bulging fontanel. A high-pitched scream, which if once heard is easily recognized and known as the hydrocephalic cry, often accompanies the headache which may now be intense. Except in infants, the abdomen becomes flat or sunken in the later stages, forming the so-called scaphoid abdomen. Constipation is the rule. Rigidity of the muscles of the neck may be noted, but distinct retraction may never occur or only in the final stages. There may now supervene irregular or associated ataxic movements. The respirations are slow and irregular, with the inspiration prolonged and sighing. The pupils may be unevenly contracted and react slowly or not at all to light. Nystagmus may be an early symptom, while conjunctivitis, strabismus, and ptosis usually appear in the final stage. Marked apathy with delirium and coma supervene. Occasionally convulsions may occur. The pupils are now almost constantly dilated. The extremities are rigid or spastic, although paralyses, monoplegic or hemiplegic in type, may appear before the terminal stage. The respirations tend now to the Cheyne-Stokes type. The final stage is usually known by the frequent convulsive seizures. The emaciation is now rapid, the pulse becomes small and irregular until the agonal stage. The eyes are sunken. Edema of the lungs may be found on physical examination. The rigidity of the neck is supplanted by paralyses in various parts of the body. Examination of the fundus usually shows an optic neuritis. The urine and feces may be involuntarily passed. The temperature toward the end may rise to 105° or 106° F., or there may be a sudden drop to subnormal.

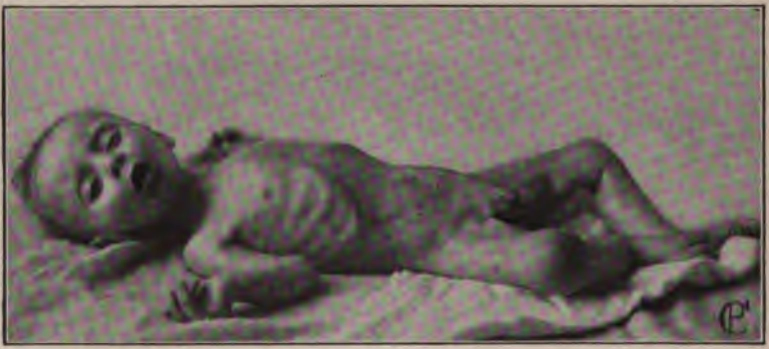

FIG. 89.—Tuberculous meningitis; patient comatose.

The reflexes are usually inhibited in this stage. Kernig's sign and the Babinski reflex are present in about 50 per cent. of the cases. Macewen's sign, or a tympanitic note on percussion over the ventricles, is obtained in those cases in which there is an internal hydrocephalus. If obtained in children over two years of age, it is of value in establishing the diagnosis.

Lumbar puncture is of great importance in making the diagnosis, and sometimes is the only practical method of making the specific diagnosis (see p. 51). In this form of meningitis the fluid frequently flows out under increased pressure; it usually is clear and contains a greater amount of protein than normal.

Fehling's solution occasionally is reduced by the fluid. If the proper technic is followed, the presence of tubercle bacilli can be demonstrated, although such expert labor should be placed in the hands of a trained pathologist. Inoculation experiments into animals may also be made for confirmation. Mononuclear cells, sometimes over 90 per cent., are present in the fluid.

Course.— The duration is usually from three to four weeks. Occasionally there are periods of apparent improvement, which may give rise to a false hope of recovery. On the other hand, cases have remained under our observation for many weeks with slow and progressive emaciation, finally terminating fatally.

Diagnosis.— The slow onset, the lack of hyperesthesia, the slower pulse and respiration, and the type of temperature curve, with the aid of lumbar puncture, are the only definite means of differentiation from the cerebrospinal type.

Some intracranial diseases may in their incipiency lead to confusion unless the characteristic symptoms of a meningitis are sought for.

Prognosis.— Although there have been several reported cures in cases in which tubercle bacilli were found after repeated lumbar punctures, the disease must be regarded as quite hopeless.

Treatment.— Quiet and rest, with bromids for the relief of the nervous symptoms, and lumbar puncture for the relief of intracranial pressure, with frequent repetition of this procedure, if followed by amelioration of the symptoms, are indicated. The diet, usually liquid, is taken in a bottle or may be given by gavage. Iodid of potash and inunctions of mercury have proved valueless in our hands.

Tuberculous Peritonitis.

Tuberculous peritonitis is a comparatively rare affection, although this variety of peritonitis is more frequently seen in childhood than the nontuberculous forms, and a diagnosis, first as to the condition itself, and then as to its particular variety, is of importance because of the direct bearing on the prognosis and surgical treatment. The peritoneum may become involved from a tuberculous focus in any part of the body. The disease is nearly always secondary and the infection is carried through the lymphatics or blood stream. Bovaird in 125 cases of general tuberculosis found the peritoneum involved in 7 per cent.

From an anatomical standpoint four forms are usually recognized — miliary, miliary with ascites, the ulcerative, and the fibrous variety.

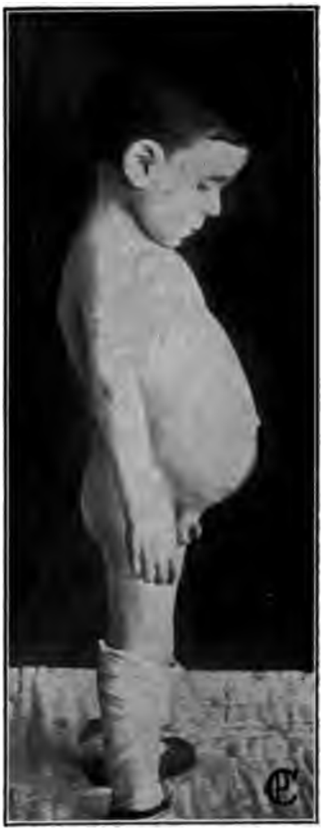

FIG. 90.— The ascitic form of tuberculous peritonitis.

THE MILIARY FORM is met with in cases of general infection. It is practically impossible to make antemortem diagnosis of this form. The tubercles are found scattered over the peritoneum and intestines in large or small numbers. Adhesions form, binding the viscera to themselves, to the neighboring organs, and the abdominal wall. On opening the abdominal cavity a serous or seropurulent fluid is found. The peritoneum is clouded and streaked with lymph. In older cases adhesions form.

THE ULCERATIVE OR CASEATING FORM. — Postmortem findings in this variety show caseating foci in the peritoneum. Lymph or pus takes the place of ascitic fluid. The intestinal coils are matted with fibrinoplastic deposits. The abdominal wall may also be found adherent to the intestines. Tuberculous masses are found scattered over the parietal and visceral peritoneum, while in some cases ulcerations occur. The glands are usually greatly enlarged, and may be found in sacculations filled with purulent fluid. Fistulous tracts may occur and perforate at or near the umbilicus.

THE FIBROUS FORM rarely gives evidences of an effusion. There is an abundance of lymph on a thickened peritoneum, studded with miliary tubercles. The peritoneal cavity may be completely obliterated by the dense matting and firm adhesions. Rolls of omentum are occasionally seen, covered with fibrous tissue. The intestines themselves adhere to each other. The characteristic of this form is a tendency to the formation of cicatrical tissue.

Symptomatology of the Special Forms.— ASCITIC FORM.— The symptoms may be very insidious. There is a slow but steady increase in the size of the abdomen, and constipation alternates with diarrhea. There may be vomiting, the appetite is capricious or lost. Careful examination may now elicit fluid in the abdominal cavity.

The superficial veins over the abdomen and lower chest are prominent. There is an evening rise of temperature, and progressive emaciation is noted. Rectal examination may disclose peritoneal nodules and enlarged mesenteric glands. An acute form is occasionally seen in which the symptoms simulate an inflammation of the small and large intestines. The fever is quite high, the abdomen rapidly becomes distended with fluid. The prognosis is better in the insidious form.

ULCERATIVE FORM.— The symptoms are those of various grades of enteritis. There is vomiting, constipation or diarrhea, abdominal pain, loss of appetite, with occasionally bloody stools. The fever is quite high, irregular in type with occasional sweating, especially on exertion, and considerable prostration.

Percussion shows areas of dullness or flatness, alternating with areas of tympany. Bimanual rectal examination may give strong evidence of the matted condition of the intestines. Occasionally the stools contain blood. Pus may be discharged through openings near the umbilicus. Emaciation is extreme, and the end comes through asthenia.

FIBROUS VARIETY.— The symptoms come on very gradually with some colicky pains in the abdomen. The bowels are usually constipated. There is some distention of the abdomen. Nausea and vomiting or symptoms of obstruction may lead to a careful examination of the abdomen, and the masses or rolls of omentum with some intraabdominal fluid may assist in establishing the diagnosis.

Diagnosis.— A child between the ages of one and six years, who has lived in an environment of tuberculosis or whose vitality has been lowered by an infectious disease, and who is languid, peevish, and has an evening rise of temperature with some enlargement of the abdomen, should be carefully examined for tuberculous peritonitis. The child may present the phthisical habitus or only appear to have lost some flesh. The skin is almost constantly dry and harsh. Passing the hand lightly over the abdomen, subcuticular nodules about the umbilicus are often felt. Fluctuation may be readily made out, or a suspicion of fluid only may be found on palpation and percussion. Bimanual rectal examination in the semirecumbent position should now be made to confirm the presence of fluid and to further ascertain the condition of the intestines, whether they are free or bound by a fibrinoplastic exudate. One accustomed to the normal conditions as found by the examining finger in children will appreciate the changes produced by a plastic exudate, and may furthermore feel hypertrophied mesenteric lymph nodes and a band of adhesions running transversely across the abdomen. If the process has so far advanced that rolls of omentum, or agglutinated masses of mesentery and intestine have formed, palpation over the abdomen and the finger in the rectum will readily reveal the presence of these tumors. The abdomen may then appear flat or gas-distended, and Thomayer's sign of dullness on percussion on the left side of the abdomen, with a tympanitic note on the right side, may be obtained; in this latter condition fluid is rarely made out before operation, and only small quantities are seen on opening the abdomen.

In the early stages of the ascitic form we should if possible exclude circulatory, renal and hepatic disturbances, and abdominal growths. The general nutrition may still be fairly good. The fluid readily gravitates to the dependent section on change of position. Corroborative evidence may be obtained by finding Marfan's symptom, that is, the presence of pleuritic friction râles at the base of the lungs, sometimes associated with small exudations into the pleura. Pain is rarely obtained on palpation, but indefinite colicky pains are complained of. If, coupled with the above symptoms, the skin is harsh and dry, and subcuticular nodules are present over the abdomen, the diagnosis, now fairly certain, should be confirmed by laboratory and tuberculin tests. The frequent use of the thermometer showing predominating small evening rises and the presence of large numbers of lymphocytes always tend in favor of a tuberculous process. In a tuberculous peritonitis the mononuclear leukocytes are generally increased. Cytological study of the tapped ascitic fluid may also assist in confirming the diagnosis. The diagnosis in the first form is not always certain without further tests, and even the last-described variety may cause confusion.

If a chronic peritonitis of the tuberculous variety is suspected, a very thorough examination of the entire body should be made for possible tuberculous disease in other organs not only to confirm the diagnosis, but to determine what shall be the character of the treatment and the prognosis. For if the lungs are involved and the spleen and liver are enlarged, general miliary tuberculosis is in all probability present, and the patient is beyond the hope of recovery. Whether or not the peritoneal process is tuberculous may be confirmed either by the skin-inoculation test of Von Pirquet, by the Moro reaction (*i.e.*, a 50 per cent. tuberculin ointment) or by the Calmette test; but this is not recommended if there is any possibility of corneal involvement. The catheterized urine may be centrifuged for the presence of tubercle bacilli, or inoculation tests can be made with guinea-pigs.

Treatment.— The trend of opinion, buoyed up by some successful results in recent years, tends toward operation in all cases of tuberculous peritonitis, especially as the operation is comparatively simple and not dangerous to life. If more regard had been paid to the general examination and only selected cases operated upon, the statistics would have been steadily in favor of operation. The ascitic form of localized tuberculous peritonitis does well under laparotomy, the plastic form rarely does well; fistulæ are apt to form, and the lungs frequently show early involvement following the laparotomy. Again, if the diagnosis can be made early in the ascitic form non-operative interference may be counseled provided the circumstances are such that all the advantages accruing from life at the seashore, rest and nutritious food are possible. Otherwise the child should be watched, and if the exudate is on the increase operation should be recommended. A life in the fresh air, confinement to bed while an active process is going on, food high in proteids and fats, with the addition of cod-liver oil and the syrup of the iodid of iron, are indicated after laparotomy, and for the inoperable cases.

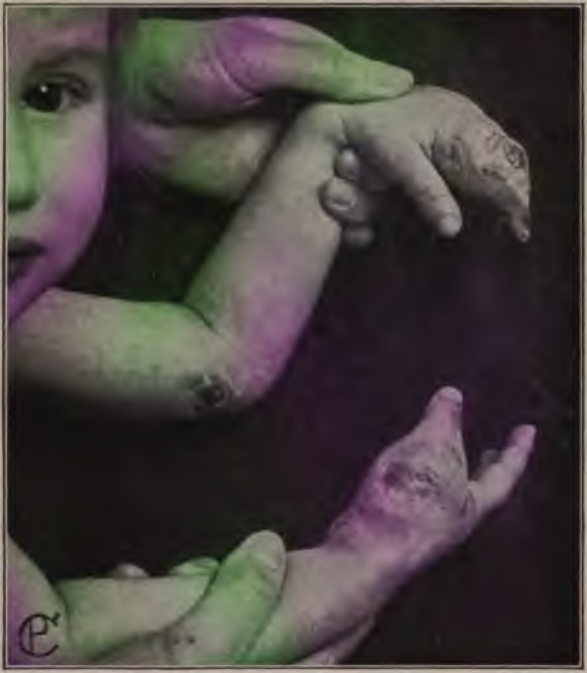

FIG. 91.— Tuberculous dactylitis.

Bone and Joint Tuberculosis.

(Caries of Bone.)

This affection is the result of the invasion of tubercle bacilli in the spongy portion of the bone. Usually beginning as a single focus, it spreads and often involves the whole epiphysis. Tubercles are formed which later may degenerate, forming many necrotic areas which may merge to form a caseating area. Granulation tissue is found at the periphery. In some instances a sequestrum forms or an abscess results. The joints are infected through the cartilage, and the disease rapidly spreads to the synovial membrane, where ulcerations form. When the cartilage becomes detached, destruction begins in the bare bone. In this way deformities so common in and about the joints are produced.

Etiology.— The infectious diseases, especially measles and scarlet fever, are probably more often the direct cause of tuberculous joint diseases than traumatism. Any devitalizing disease, however, must be considered as a factor. The affection is extremely rare in infants. After the third year it is distinctly a disease of childhood.

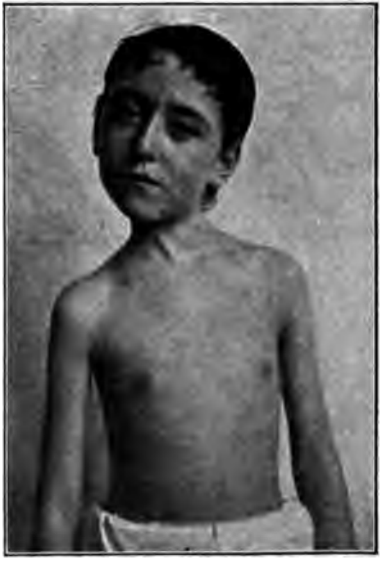

FIG. 92.— Torticollis, due to cervical Pott's disease. *(Bradford and Lovett.)*

Tuberculosis of the Vertebræ.

(Pott's Disease; Caries of the Spine; Spondylitis.)

This affection is the result of a tuberculous osteitis in the spongy portion of the bodies of the vertebra.

It is extremely common in early childhood, and, according to Taylor, more than half the cases occur under six years of age. The dorsal region is most often affected; the cervical less commonly.

Diagnosis.— If careful physical examinations were oftener made with the child completely undressed, the diagnosis would more frequently be reached in the early stages. The abnormalities which should attract attention are the rigidity of the spine, and in walking a deficient mobility of the spinal column when tested by the examiner. Deformities due to necrosis of the bone will be apparent on observation, often forming the familiar humpback. The peculiar attitude and gait assumed may attract attention, even before the child is undressed.

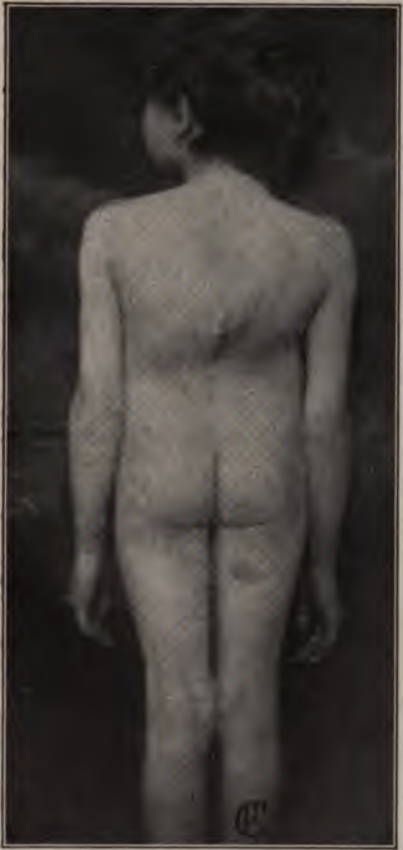

FIG. 93.— Dorsal Pott's disease.

IN CERVICAL POTT'S DISEASE, wry-neck may be the first symptom complained of. The differential diagnosis from other forms of torticollis is sometimes very difficult. The slower onset, the posture, and the general muscular fixation serve to distinguish it.

DORSAL POTT'S DISEASE is distinguished by the erect military gait, the lateral deviation, with a bony deformity, which can be palpated and usually easily seen.

LUMBAR POTT'S DISEASE.— Here the attitude of lordosis should attract attention, especially if accompanied with deviation to one side, and a careful abnormal gait. Hyperextention of the leg in the prone position elicits the sign of psoas contraction.

PARALYSIS.— This may occur at any time in tuberculous spinal disease, although as a rule it occurs as one of the later symptoms.

The patellar reflexes are increased, ankle clonus may be present, and the pain, if absent before, is now present or increased in severity.

A RACHITIC SPINE is often mistaken for Pott's disease. The curve, however, is rounded and the spine is supple. If the child is raised with the hands of the examiner in the axilla the curvature tends to disappear. Other bony changes or the symptoms of rickets may be present. The deformity in Pott's disease does not disappear when the child is raised or is in the prone position.

Treatment.— This is mainly orthopedic and involves the use of apparatus to promote spinal rest (Fig. 95) and the correction and prevention of deformities. The medical treatment encompasses dietetics and hygienic management. The Albee bone graft offers a more rapid cure with less deformity.

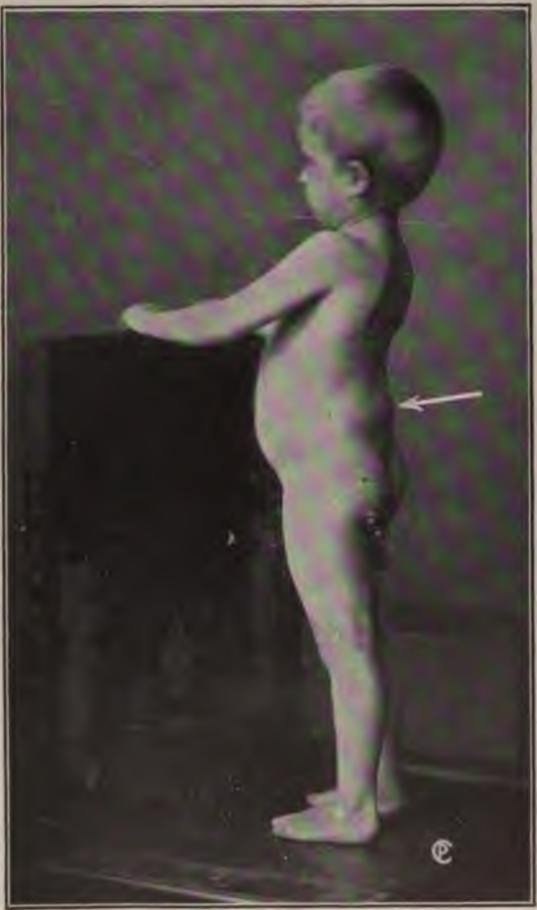

FIG. 94.— Lumbar Pott's disease.

Tuberculous Disease of the Hip.

(Hip-joint Disease; Morbus Coxæ; Coxalgia.)

This affection is due to a tuberculous osteitis of the head of the femur, of the acetabulum, or both. The disease usually begins gradually, the parents first noticing a limp. Night cries occur, but pain is a very variable symptom. The attitude assumed is one with a little flexion of the knee of the affected side and a slight tilting of the pelvis. In later stages of the disease much can be learned by testing the child for freedom of motion, picking up objects, mensuration, pain and swelling. The classical symptoms upon which a diagnosis can be based with certainty are limit of motion, muscular spasm, pain, swelling, attitude, shortening and atrophy of muscle. The *X*-rays and the tuberculin tests may be required in difficult cases.

Treatment.— Immobilization and protection of the joint by casts, traction, and later, braces; a life in the open air and good food do much to assist the orthopedic measures. Osteotomy and excisions are performed only in desperate cases.

Tuberculous Disease of the Knee.

(*Gonitis Tuberculosa; White Swelling.*)

The epiphyses are nearly always primarily involved. It is most commonly observed in children, and, after the spine and hip involvement, it occurs most frequently.

The diagnosis is usually quite readily made, as the knee-joint easily lends itself to examination. Swelling, with lameness which may be intermittent, are the first diagnostic symptoms. Stiffness and pain follow. Muscular spasm on passive motion may be observed. The knee may be held in a position of flexion. Infectious synovitis is distinguished by the more rapid onset, temperature, and signs of localized inflammation.

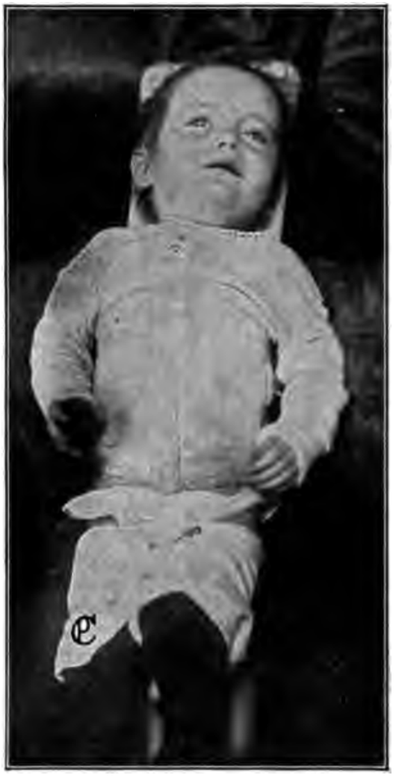

FIG. 95.— **Infant with Pott's disease on a Bradford frame.**

Chronic synovitis is very slow in its course and is not accompanied by much lameness or pain. Sometimes crepitus may be obtained. Eventually a true tumor albus may result. The *X*-rays, tuberculin, and inoculation tests may be made if necessary.

Treatment.—The medical treatment does not differ from that of tuberculosis elsewhere. The joint should be encased in a splint which will prevent joint motion of the knee and foot.

Treatment of Tuberculosis in General.

Prophylactic.—There are but few diseases in which prophylaxis can accomplish so much for the child as in tuberculosis. Upon the physician and health officer the duty devolves, and it begins even before conception. It is largely a problem of sociology and preventative medicine.

Laws which have lately been passed in many States prohibiting the sale of tuberculous milk and meat, tenement-house inspection, health-board notification, and the educational exhibits will all tend to decrease the spread of this disease. Tuberculous mothers should not nurse their children because of danger in the close contact.

Milk for infant feeding should be obtained from tuberculin tested cows, or should have the stamp of approval of a medical commission as being "certified." Where this is not possible the milk should be pasteurized.

The children of tuberculous parents should be brought up, if possible, in the country and early trained to live an outdoor life. Such defects as adenoids or carious teeth should be removed. They should be especially guarded from measles and whooping-cough.

School houses should be so arranged that proper ventilation can be obtained in rooms with ample air space and sunlight. Teachers, who as a class are particularly susceptible to the disease, should be frequently examined.

Knopf has formulated the following valuable set of rules for school children:

Do not spit except in a spittoon or a piece of cloth or a handkerchief used for that purpose alone. On your return home, have the cloth burned by your mother or the handkerchief put in water until ready for the wash.

Never spit on a slate, floor, sidewalk, or playground.

Do not put your fingers into your mouth.

Do not pick your nose or wipe it on your hand or sleeve.

Do not wet your fingers in your mouth when turning the leaves of books.

Do not put pencils into your mouth or wet them with your lips.

Do not hold money in your mouth.

Do not put pins in your mouth.

Do not put anything into your mouth except food and drink.

Do not swap apple cores, candy, chewing-gum, half-eaten food, whistles, bean-blowers, or anything that is put into the mouth.

Peel or wash your fruit before eating it.

Never cough or sneeze in a person's face. Turn your face to one side and hold a handkerchief before your mouth.

General.— Reports from the sanatoria would indicate that the child over four years of age afflicted with tuberculosis in the incipient stage has a better prognosis than the young adult. Graduated heliotherapy is a form of treatment that is particularly suitable to the child. This is borne out by our own dispensary cases, which have had but indifferent opportunities, and still have shown gratifying results.

The diet for these children should consist principally of milk, eggs, and fats; such as butter, cream, olive or cod-liver oil, and meat for older children. The syrup of the iodid of iron should be given. If the appetite fails a change from inland to seashore or *vice versa* may be proposed, or if this is not feasible the tincture of nux vomica with the compound tincture of cardamon can be given before meals. Medication directed to the disease itself is useless and often harmful. In hopeless cases the symptoms are alleviated as they arise.

The tuberculin treatment is again being tried in children's hospitals and with more success. Good results are obtained in localized conditions, and some cases having pulmonary involvement have been benefited. The former unsatisfactory results are attributable to our meager knowledge of its action, and probably to overdosage, which seemed to produce harmful results.

Children in whom the disease seems to be arrested, as shown by absence of temperature and increase in weight, are especially suitable for the tuberculin treatment. The injection in these quantities may be given twice a week until a tolerance is reached, when the dosage may be slowly increased by 0.1 mg., depending upon the effect produced. 1/12,000 to 1/8000 mg. of T. R. tuberculin is given to a child one year old. 1/4000 mg. for a child five years old. 1/3000 mg. for a child ten to twelve years old. Its effect should be watched, and a dose given every two weeks. The weight and general progress of the child must act as guides.

SECTION VII.

DISEASES OF THE RESPIRATORY TRACT.

CHAPTER XXIII.

DISEASES OF THE UPPER RESPIRATORY TRACT.

Acute Rhinitis.

This is quite commonly seen in infants and children, and is due to bacterial infection as a result of a temporary or prolonged lowered resistance. This is made possible by keeping the child in superheated apartments, sudden changes of temperature, or exposing it to direct infection from a member of the household. There is at first a constant serous and later mucopurulent discharge from the nares, with irritability, restlessness in sleep, loss of appetite, and a slight temperature.

In infancy the symptoms are of greater import than in childhood, as it may seriously interfere with nursing and thus add to the lowered resistance through malnutrition. Sleep is broken, feeding rules are interfered with and disturbances of the gastrointestinal tract may result. Older children complain of fullness in the head and chilliness. Children who have frequent attacks of rhinitis are ofttimes sufferers from adenoids.

Treatment.— While rhinitis is a self-limited disease, lasting from one to two weeks, it should not be left untreated. The infection may spread to the lower respiratory tract and end disastrously. If possible, remove the indirect cause, as, for example, badly heated and unventilated rooms. The child is best confined to one room, especially if there are other children. Locally liquid albolin with camphor gr. i to the ounce may be instilled into the nose. A solution of adrenalin chlorid 1 to 5000 in infants and 1 to 1000 in older children gives temporary relief before suckling and at bedtime. Morse found it necessary to introduce a small rubber catheter into each nostril in a serious case to enable it to breathe. Small supportive doses of strychnia 1/240 t.i.d. are sometimes necessary to assist the child in ridding itself of the infection. The ears should be examined daily, as an otitis is very likely to supervene by extension.

Epistaxis.

Bleeding from the nose is not often seen in infants, although not uncommon in children; when it occurs in infants it is usually a result of adenoids, syphilitic rhinitis, or an ulceration of the nasal mucous membrane, commonly found on the anterior and inferior portion of the septum. Children are liable to nose-bleed because of their tendency to acquire turgidity of the nasal mucous membrane. Traumatism, adenoids, foreign bodies, and purulent rhinitis are among the more common causative factors, while a nose-bleed is also seen in the course of many of the infectious and blood diseases of early life. A history of frequent epistaxis should lead one to examine for adenoids, ulcers, or cardiac disease.

Treatment.— Keep the child in the upright position and apply pressure with the fingers against the septum, meanwhile having an ice application held over the cervical spine. If bleeding still persists pack the nose with cotton which has been dipped in a 1/2000 adrenalin solution.

As soon as feasible, make a careful examination for the underlying cause. If an ulcer, cleanse and apply a 20 per cent. solution of nitrate of silver. If adenoids are present, they must be removed; this is especially true in infants who have frequent nose-bleed. Warning should be given the attendant as to the significance of swallowed blood from a nose-bleed, which may occasion unnecessary alarm when vomited.

Foreign Bodies in the Nose.

In children, usually between two and five years, it is not uncommon to find that they have placed various objects in their noses. These may cause immediate symptoms of annoyance or distress or, becoming lodged, cause a unilateral nasal discharge that is persistent. Closer examination shows a partial or total occlusion of that side of the nares, a mucopurulent discharge, occasionally blood-tinged, and, with some objects, an odor of putrefaction. We have removed peas, pearl buttons, shoe-buttons, paper, and a kernel of corn.

Treatment.— Place the child in a good light and use a small nasal speculum. The object if *in situ* for some time may be covered by mucous membrane or altered in appearance so as to be unrecognizable. If there is still doubt, a probe slightly bent can be inserted and the obstruction recognized; wipe out the discharge and with a nasal forceps, snare, or hook remove it. If the object has been recently inserted and is not high up, causing the child to sneeze by tickling the opposite side has succeeded easily in effecting its dislodgement. The rhinitis induced clears up rapidly after the offending material is removed.

Examination of the Throat in Infants.

A careful inspection of the throat should be made as part of the routine examination of the sick infant. Many attacks of fever and illness in infants are due to inflammation of the throat, such attacks being not infrequently attributed to some other cause. The principal reason for such a possible error lies in the difficulty in getting a satisfactory view of the fauces. This is especially true in very young infants. The tongue is high and the soft palate and pillars of the fauces low down, so that it is extremely difficult to get a clear view of the parts. Unless a satisfactory view is obtained at the first attempt it becomes increasingly difficult, if not impossible, to see clearly at all. The opening is so small that a little mucus produced by the irritation of a second or third examination completely obstructs the view. In addition to this some milk is apt to be regurgitated from the stomach, and then it is absolutely impossible to see the real condition of the mucous membrane.

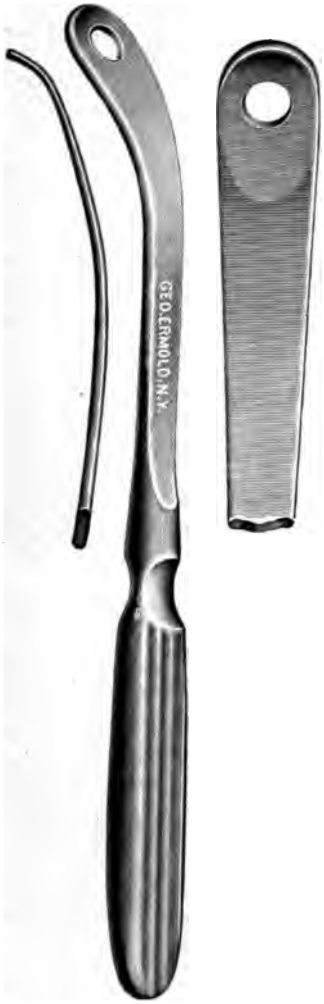

FIG. 96.— Chapin's tongue depressor (straight).

Most of the tongue depressors in use are not only too large, but do not have the proper slant for the infant's tongue. As a result, the back of the tongue, not being properly held, arches up and obstructs the view of the fauces. The depressor here presented is small enough for the youngest infant's mouth, and is intended to curve over the tongue to the base of the epiglottis. It can likewise be used in older subjects. By exercising a little pressure downward and forward the parts will come into clear view. Of course the infant should be properly held and placed before a good light (Fig. 98). When everything is in readiness the left hand is used to steady the head while the right hand manipulates the depressor. These details will naturally suggest themselves to the careful physician, but are often overlooked, with the result of unduly fretting the infant and failing in the examination.

Pharyngitis and Tonsillitis in Infants.— In infants, tonsillitis, as distinct from pharyngitis, is rare. The whole mucous membrane of the pharynx and tonsils is involved in the inflammation. The tonsils may be somewhat enlarged and are covered with very fine pin-head points of a whitish exudation. These points can be recognized only when the fauces are well exposed in a good light. In rare instances the uvula is swollen and infiltrated. The secondary forms of pharyngitis seen in most infective diseases will not be here considered. The primary form is apt to be overlooked from the absence of symptoms referable to the throat, and the inability of the infant to call attention to the affected part. The swelling of the lymph-glands of the neck, so often noted in diphtheria and scarlatina, is not usually present in primary pharyngitis. The two most common predisposing causes of primary throat inflammation in infants are: (1) disordered stomach and (2) exposure to cold. The frequent mistakes in the feeding of infants, especially overfeeding, produce an acid fermentation in the stomach. By direct continuity the mucous membrane of the pharynx and mouth may become irritated and inflamed. When the latter happens the temperature keeps up instead of subsiding when the stomach is relieved of its contents by vomiting or by their passage into the bowel. Exposure to cold is likewise a common predisposing cause. Many infants, especially among the poor, are too warmly clad, especially about the neck and chest. As a result the skin is constantly moist. Such infants live and sleep in overheated rooms. In these cases an ordinary exposure to cold will induce throat inflammation through bacterial invasion.

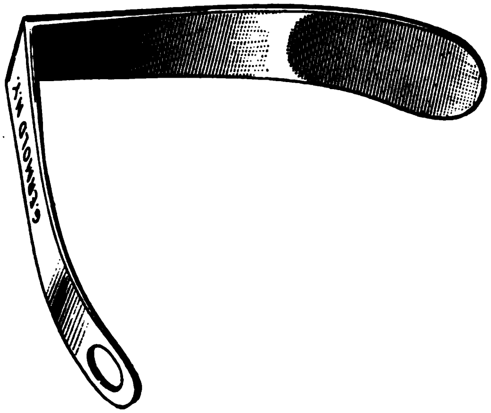

FIG. 97.— Chapin's tongue depressor (curved).

It will be noticed that the causes here given are mentioned as *predisposing*. Most, if not all, forms of tonsillar and pharyngeal inflammation are due to the presence of pathogenic organisms. In health and under good hygienic conditions the mucous membrane of the throat may not be unfavorably affected by organisms, but under depressing conditions, particularly when the digestive tract is in an irritated condition, the throats of infants are vulnerable. It is quite possible that many impurities may likewise find their way to the mouth and throat by means of dirty fingers or objects which are given to infants as toys and which quickly find their way to the mouth.

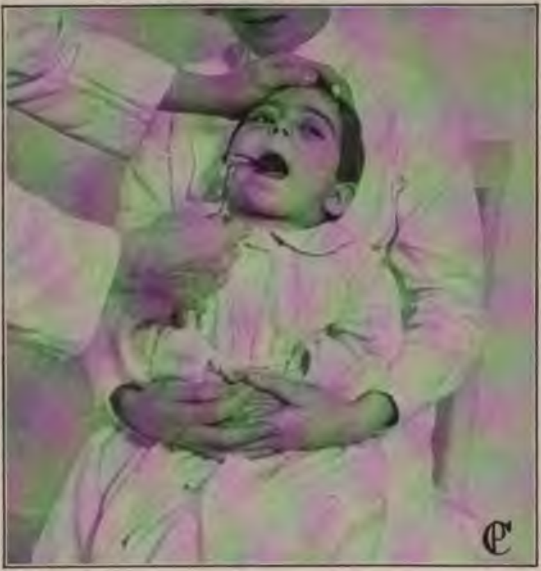

FIG. 98.— Method for examination of the throat.

Treatment.— The treatment consists in removing the cause, whether it be a deranged stomach, defective action of the skin, or faulty hygienic surroundings. The recurrence of attacks of pharyngitis in infants is the most common cause of postnasal rhinitis in children. The repeated irritation induced by these attacks causes hypertrophy of the adenoid tissue at the vault of the pharynx, which is the invariable accompaniment of rhinitis in the later years of childhood.

The immediate treatment consists in opening the bowels with a mild laxative dose of castor oil or calomel, followed by small and frequent doses of tincture of aconite, one-quarter to one-half a drop every two hours. If restlessness is a prominent symptom, a grain of phenacetin may be given every three hours for a few doses. As the acute form of the disease is self-limited, it is not well to give drugs very freely, especially those that tend to upset the digestion. The importance of recognizing the condition consists in taking steps to prevent its recurrence.

Acute Pharyngitis.

Definition.— An acute inflammation of the pharynx and neighboring structures.

Etiology.— Sudden exposure to inclement weather which is dust and germ laden predisposes to the affection. It is present in the early stages of many of the acute infectious diseases and may accompany gastric disorders. Exposure to chemical irritants in the form of vapors which produce a pharyngitis. Children with obstructions in the respiratory tract, especially adenoid growths, are liable to repeated attacks.

Symptomatology.— Locally there is seen a reddened congested pharynx with the uvula and tonsils sharing in the inflammatory process. The larynx and nasopharynx may also be involved. There may be a rise of pulse and temperature, but this is rarely high. The child complains of sore throat and difficulty in swallowing. Under appropriate treatment there is a rapid subsidence of symptoms.

Diagnosis.— With high temperature and vomiting scarlet fever must be kept in mind. Measles will show the presence of Koplik's spots, while a diphtheritic process will show a beginning membrane and give a positive culture.

Treatment.— Prophylactic treatment resolves itself into the removal of any obstructions to proper breathing and the maintenance of proper resistance against infections.

Locally.— Cold compresses applied every half-hour. Mild antiseptic gargles for older children, such as the Liq., antisepticus alkalinus N.F. or Dobell's solution, one part to eight of water will suffice if used every two hours.

Constitutional.— An initial laxative, such as the citrate of magnesia or calomel, should be prescribed. If there is high temperature and much discomfort phenacetin with salol, 2 grains of the former to 1½ grains of the latter, for a five-year-old child, will be efficacious. The diet should consist of cool demulcent preparations, such as oatmeal or barley gruel, junket or ice-cream.

Acute Follicular Tonsillitis.

(*Acute Amygdalitis.*)

This is a self-limited disease of short duration, usually bilateral, with constitutional symptoms and a marked local infective process involving the tonsillar crypts and the entire glandular structure.

Etiology.— Children with rheumatic tendency or of a lymphatic type are prone to acute attacks; those with chronically enlarged tonsils being particularly susceptible. In these latter cases, slight exposure to cold often brings on an attack. One infection predisposes to a second, presumably because of the presence of bacteria in the crypts or their accessibility to the tonsil through the mouth and nose.

Symptomatology.— The onset of tonsillitis is sudden; a chill or chilly sensations often being the first evidence. This may be followed by marked prostration, malaise, and vomiting. The temperature is high, frequently rising to 104° or 105° F. At first the tonsils and soft palate are reddened and swollen, and in a few hours cream-colored isolated spots appear on the tonsil plugging the mouths of the crypts. These spots are about the size of a pin-head, though at times they coalesce, forming a pseudomembrane which can be easily wiped off with a swab without producing a denuded or bleeding area. The membrane does not spread to the soft palate nor to the pillars of the pharynx.

Frequently the glands at the angle of the jaw are enlarged and these, together with the inflamed tonsils, produce considerable discomfort and pain on swallowing. A routine examination of the throat in all cases will often disclose a tonsillitis which has produced no subjective symptoms.

Course and Prognosis.— The inflammatory condition is active for at least three or four days even under treatment, but because of the constitutional symptoms convalescence may be slow; ten days usually elapsing during this stage. The prognosis is good if the patient is well cared for, though the danger of endocarditis and the possibility of peritonsillar abscess must not be forgotten.

Differential Diagnosis.— At the onset, tonsilitis may be confounded with malaria, pneumonia, scarlet fever, or influenza. A careful history and blood examination will usually eliminate the first; a careful physical examination and absence of disturbed pulse-respiration ratio would differentiate it from pneumonia, while further observation for twenty-four hours will render the diagnosis more certain on account of the more characteristic appearance of the tonsils. From diphtheria, the absence of Klebs-Loeffler bacilli, the sudden onset and initial chill, the position and character of the local lesion, the high temperature and the absence of a history of exposure to diphtheria infection point strongly to the diagnosis of follicular tonsillitis. (See Plate XI.)

In ulceromembranous tonsillitis, the constitutional symptoms are much milder; the pain in the throat more severe, and enlargement of lymph-glands more marked. The local lesion is usually one-sided, the affected tonsil being covered with a dirty yellowish exudate closely resembling the membrane of diphtheria.

Treatment.— Rest in bed is imperative on account of the great danger of endocarditis. Depletion by calomel gr. 1/10 every half-hour for ten doses will reduce the intoxication. Hot fomentations or cold compresses to the throat will give relief from pain. Alcohol sponge baths when the temperature is high will add materially to the comfort of the patient. During the first twelve to twenty-four hours the following may be given to a child two years old:

℞ Phenacetini	gr. ½
Salol	gr. j
Oleosacchari anisi, q.s.	
M. Ft. pulv.	No. j

Misce et signa.—One every three hours.

For young children who have not learned to gargle, a very efficient local application to be used on a swab every two or three hours is the following:

℞ Tincturæ iodini	♏ iv
Argyrol sol. 50%	gtt. iij
Aquæ	q.s. ad. ʒss

Misce et signa.—Swab on tonsils every two to three hours.

Older children may gargle with the Liq. antiseptic. alkalinus (N. F.) or any of the equally efficient mild antiseptic solutions.

Ulcero-membranous Tonsillitis.

(Vincent's Angina.)

Clinically, this affection closely resembles a mild diphtheria; bacteriologically, the findings show the presence of an elongated fusiform bacillus and long wavy spirilli. The general symptoms are mild or absent except for the pain in the throat, which is severe.

The lesion is a superficial ulcer on the tonsil the size of a dime, usually unilateral in location, of a dirty yellow color, and exhibiting no great tendency to spread. If the ulceration is deep, upon an attempt to pull off the membrane the underlying surface bleeds slightly. The cervical glands are enlarged and the muscles along the side of the neck are stiff and tender. The pulse and temperature are moderately increased, the latter closely resembling the temperature in diphtheria.

As a rule, the breath is foul and there is much drooling. Hot antiseptic gargles and mildly astringent applications (see p. 332) locally, combined with hot or cold external applications, are very efficient measures of relief.

The disease runs a more prolonged course than a follicular tonsillitis. A smear and culture should be made in all suspicious cases for purposes of differentiation.

Streptococcus Sore Throat (Streptococcic Angina).

(Formerly considered as: Membranous Tonsillitis; Croupous Tonsillitis; Pseudo-diphtheria.)

This disease may occur as a secondary condition in various infectious diseases, especially scarlatina, or as a primary inflammation, when it may prove to be a form of milk poisoning.

Etiology.— The inflammation is caused by streptococci of varying degrees of virulence, sometimes associated with staphylococci. Children with lowered vitality from any cause, and especially institutional children, may harbor streptococci in their throats. The same condition may occasionally be found in healthy children, when cold or inclement weather may cause the inception of the disease. In recent years, several epidemics have been traced to infected milk. It has been found that a combination of mastitis in cows with sore throat in the milkers has been followed by an epidemic in the region supplied by such a farm. Conversely, it has been proven by Capps and others that hemolytic streptococci of human origin may cause mastitis lasting for several weeks in cows, which time roughly corresponds to the relation of milk-borne epidemics.

Symptomatology.— Two forms of the disease may be recognized, the mild and severe. The onset is rapid and well marked with vomiting, chilliness, headache and grippy pains. The temperature is usually high — from 103° to 105° F.— which in the milder cases subsides by the third or fourth day. The condition of the throat is variable. At first there is a diffused redness involving pharynx and tonsils, resembling a scarlatina throat, but this is soon followed by patches of exudate in the form of a pseudomembrane. These patches may be limited to the tonsils, but in severe cases they may cover the pharynx and extend to the soft palate, the nose and rarely the larynx. Morphologically the membrane is like that of diphtheria, but contains streptococci and no diphtheria bacilli. In severe cases it assumes a yellowish or dirty-green appearance. The lymph nodes of the neck become swollen and sore, and, in severe cases, may undergo suppuration. Abscesses in the peritonsillar region may also occur. There is always prostration, but, in the milder cases, the symptoms usually subside in four or five days and the patient goes on to complete recovery. In the more serious type there is evidence of an extensive streptococcus infection. This general sepsis shows itself by great prostration, irregular and high temperature, and occasionally delirium or stupor. Nephritis usually supervenes, and pleurisy, bronchopneumonia and even erysipelas may occur and prove to be the terminal condition.

Diagnosis and Prognosis.— The only positive method of differentiation from diphtheria is by culture. The membranes seen during the early course of scarlatina are usually caused by streptococci. The prognosis is good in all but the severest types of the disease. In the latter the mortality may run as high as from 10 to 20 per cent.

Treatment.— In young children antitoxin should be given at the start if there is any doubt as to the nature of the disease. Benefit will be derived from irrigation of the throat, and nose if affected, with hot normal salt solution as in diphtheria. Ice bags to the neck may be applied when this part is swollen or painful. Stimulation by strychnin, camphor or caffein may be required in the severe cases, and soft nourishment, frequently administered, will serve to keep up the strength. When occurring as an epidemic the milk supply of the affected area must be diligently investigated by the health authorities, and any suspected farm quarantined and its milk supply cut off. This was successfully done in the epidemics at Boston, Chicago and Baltimore.

Chronic Tonsillar Hypertrophy.

A condition of chronic enlargement of the tonsils is seen in many children giving a history of repeated attacks of tonsillitis, or as a result of the infectious diseases. Adenoid vegetations and hypertrophied tonsils are associated in many cases.

Symptomatology.— There is impaired phonation and the train of symptoms which are associated with adenoids, the distress being especially produced at night during sleep. Restlessness and snoring are marked. Anemia and anorexia result.

Treatment.— Chronic enlargements should be removed. Cocain as an anesthetic should not be used. If adenoids are present remove the tonsils first. An anesthetic is necessary, and the child should be prepared as for the adenoid operation.

The head may be slightly raised and the assistant should gently press the tonsils from the outside, toward the middle line. The results obtained seem to warrant complete excision with special instruments. Complete enucleation is desirable, produces less traumatism, and better after-effects.

Adenoids.

(*Hypertrophy of the Pharyngeal Tonsil.*)

This term is applied to a hypertrophy of the lymphoid tissue normally found in the pharyngeal vault.

Etiology.— Adenoids are found at all ages and are far from infrequent in infants. Children who have lived in a poor hygienic environment or whose parents have chronic diseases seem to inherit a tendency to adenoids. They are usually associated with enlargement of the faucial tonsils. Rickets and the condition known as the lymphatic diathesis predispose to adenoid vegetations. Kerley believes that the pernicious use of the so-called comforter with the constant sucking is directly productive of adenoids.

Symptomatology in Infants.— The symptoms differ considerably in infants, and therefore will be described separately. The babe may be brought because it cannot suckle without frequently stopping to breathe through its mouth. Sleep is broken and the infant cries and almost chokes when it drops into a deep sleep. A persistent rhinitis is commonly observed, and sniffling may be the most prominent symptom. The expression is not changed as in older children.

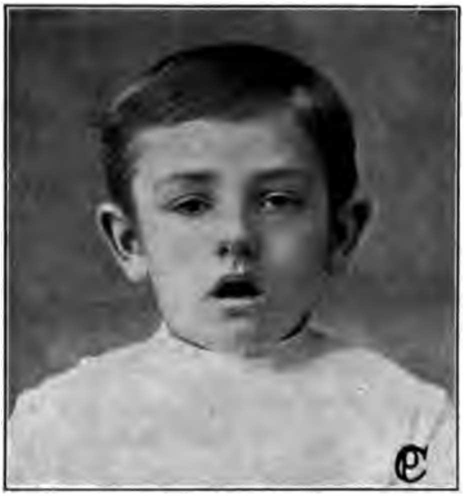

FIG. 99.— Typical adenoid face.

In Children.— In early cases the child is brought for examination because of frequent "colds in the head" associated with troubled sleep and snoring. In more aggravated conditions, mouth-breathing, snoring at night with tossing, restless sleep, and occasional night terrors should lead to a careful nasopharyngeal examination. In typical cases, the vacant expression, fish-like face, and open mouth, often with a high arched palate, are readily noted. The face in these mouth-breathers has often been visibly deformed (Fig. 99). The following characteristics make the diagnosis simple: partly pursed mouth, protruding lower jaw: narrowed long face: V-shaped palate; enlarged tonsils; narrow alæ nasi: dull eyes; pale mucous membranes; narrowed chest, sometimes otitis and evidences of general malnutrition. These children have a nasal twang to the voice and are poor scholars. They tire easily, do not eat well, and may suffer from incontinence of urine. There may be partial deafness from obstruction of the Eustachian tube. If a granular pharyngitis with plugs of mucus hanging from the posterior nares is observed, adenoids are usually present. A useful test generally indicating nasal obstruction due to adenoids is to request the child to repeat the words "Clapham Common" which he cannot enunciate without a nasal twang.

Examination.— In infants it is a difficult procedure, but may be occasionally accomplished with care and patience; the little finger must be used for exploration as the space is so small. In older children the finger properly protected should be passed into the nasopharyngeal space and the amount and character of the adenoid tissue appreciated. Soft pendulous masses or firm growths may be felt and, if the vault is found to be occluded with hypertrophied tissue, operative interference should be resorted to.

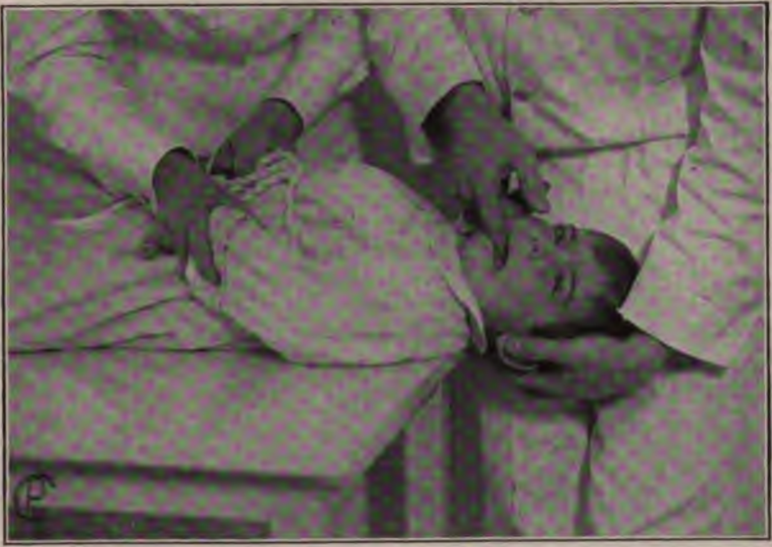

FIG. 100.— Method of palpating for adenoids.

Treatment in Infants.— If the symptoms of obstruction are such as to interfere with the infant's nutrition, the adenoids should be carefully and completely removed by an expert. Palliative measures are ofttimes successful in less aggravated cases, and we have found the instillation of a mixture such as the following to be of benefit:

℞ Camphoræ .... gr. j
Menthol .... gr. j
Resorcini .... gr. ij
Benzoinol .... ℥j
Misce et signa.— Five drops every three hours into the nares with a medicine dropper.

℞ Adrenalini inhalantis .... ʒss
Liquidi albolini ....q. s. ad ℥ss
Misce et signa.— A few drops in nares night and morning.

In Older Children.— Palliative measures here are useless. The operation should be performed under a general anesthetic if there are no contraindications, such as bronchitis, acute tonsillitis, etc. The adenoids, and if present, the enlarged tonsils are removed at the same time. The after-treatment is to break up the habit of mouth-breathing by careful instructions in proper breathing and corrective exercises. (See page 83.)

Peritonsillar Abscess.

(Quinsy.)

A retropharyngeal abscess is more common in infancy than peritonsillar abscess. Older children, however, have abscess formation in the peritonsillar tissue, accompanied by fever, chilliness and difficult swallowing. The mouth is opened with difficulty and the tonsil on one side is seen to bulge forward. The finger elicits fluctuation when the condition is at its height.

Treatment.— In the early stages calomel or effervescent citrate of magnesia may be given for the bowels. Salol and phenacetin, one and a half grains of each, may be given every three hours for a five-year-old child. Cold milk sucked through a tube is agreeable and keeps up nutrition. Incise with a guarded scalpel, and drain as soon as a diagnosis of an abscess is made. A gargle and occasional digital pressure for evacuation of the pus made over the affected site serve to prevent reinfection.

Retropharyngeal Abscess.

This abscess is seen not rarely in infants and children below the age of two years. Ill-nourished children are more prone to it because of their lowered vitality, and infection takes place from the organisms commonly found in the mouth.

Symptomatology.— The infant is usually brought for examination because of difficulty in breathing. In the early stages there is mainly an inspiratory dyspnea, but as the abscess grows larger difficulty is experienced both in inspiration and expiration. During sleep there is a persistent rattling snore and the child frequently awakes to change its position. The child refuses nourishment or takes it with great difficulty. The temperature is irregular and fluctuates from 100° to 103° F. When the head is bent forward; the dyspnea is increased.

Inspection with a suitable tongue depressor will show a rounded reddened mass protruding almost from the center or on one side of the pharyngeal wall. The examining finger detects fluctuation.

Treatment.— It is imperative that the abscess be opened and thoroughly drained. The child's head should be held well forward and then downward when the abscess has been opened to prevent aspiration of the pus. Strychnin and whiskey are usually indicated to combat the septic absorption. In a few of our septic cases it has been necessary to feed the child by gavage for a few days following the evacuation of the pus.

Acute Laryngitis.

(Spasmodic Croup; Spasmodic Laryngitis; False Croup; Catarrhal Croup.)

Etiology.— This is usually due to bacterial infection made possible by sudden exposure to cold or wet. It is most commonly met with from the second to the fifth year of life and is apt to recur. Laryngitis occasionally antecedes the eruption in measles. Children who have the spasmophilic tendency or who have nasopharyngeal obstructions are predisposed to the affection.

Symptomatology.— The attacks usually come on in the evening or at night. The child has appeared to be quite well during the day, and no symptoms have been observed except a slight rhinitis. Without warning a croupy harsh and brassy cough develops, accompanied by loud croupy breathing, heard with inspiration, expiration being quite noiseless. The patient is alarmed and the sleep is restless. The cough thoroughly alarms the mother and her fright is communicated to the child. In severe attacks the patient must sit up in bed to breathe; the suprasternal notch and diaphragmatic groove are retracted. After the attacks the child is exhausted and wet with perspiration. There may or may not be any temperature. The attacks even if uninfluenced by treatment, subside toward the morning hours, the harsh breathing ceases, and the child quietly rests. On the succeeding day the patient is ready to play and the cough while present is not annoying. For several nights there will be a repetition of the dyspnea and croupy cough.

Diagnosis.— Laryngeal diphtheria must be excluded. In diphtheria the breathing slowly becomes worse with no remissions. The constitutional symptoms are more marked and the inspiratory stridor may be present without the croupy cough. Seek safety in a culture, and if the weight of evidence leans toward diphtheria give antitoxin.

Differential Diagnosis.

ACUTE LARYNGITIS.	DIPHTHERITIC LARYNGITIS.
Sudden onset.	More gradual invasion.
Dyspnea intense from start but evanescent.	Dyspnea slowly but progressively worse.
Cough resonant and brassy (barking).	Cough muffled and suppressed.
Voice, usually normal.	Voice muffled and almost lost.
Inspiratory stridor.	Inspiratory and expiratory stridor. Inspiratory more marked.
Albumin rarely in urine.	Albumin commonly found.
No membrane seen.	Membrane may be seen in pharynx and tonsils or coughed up.

For differential diagnosis, from Laryngismus Stridulus, see p. 341.

Retropharyngeal abscess will be differentiated by the increase in dyspnea when the head is dropped forward and by directly palpating a fluctuating mass.

Prognosis.— Distinctly favorable, never fatal, but recurrences are common.

Treatment.— Place the child in a warm, moist room. In mild cases an emetic dose of the wine of ipecac, half a dram every half-hour until vomiting ensues, may be sufficient to give relief. A warm mustard bath aids the result. An enema should be ordered if the bowels have not recently moved. In severer cases a croup tent (see page 341) should be made over the crib and a croup kettle started in which has been placed a dram or two of the compound tincture of benzoin. Emesis should be brought about as rapidly as possible. Antipyrin gr. 3 for a three-year-old child acts as an antispasmodic. If there is cyanosis and serious obstruction intubation may be necessary, however a smear and culture should be made to exclude diphtheria if possible, but it should be remembered that a negative culture does not mean that diphtheria is not present.

The succeeding day should be spent quietly, a light diet given and the bowels kept open. If there are adenoids present, these should be removed at a later date.

Edema of the Glottis.

(Submucous laryngitis.)

Definition.— This is an infiltration of serum into the submucous layer of the glottis and the neighboring aryepiglottic folds.

Etiology.— Serous infiltration may result from the irritative action of corrosive drugs accidentally swallowed, from foreign bodies, or it may occur during the course of nephritis, syphilis, the infectious diseases, streptococcic inflammation of the larynx or its neighboring structures by extension. It occasionally occurs in severe cardiac affections and with extensive edema of the lungs. Tumors, such as papillomata, have produced the condition. The angioneurotic type of edema of the glottis is extremely rare.

Symptomatology.— The striking symptom is the inspiratory dyspnea which results. There is usually some stridor and a muffled voice. Pain and dysphagia are present when the edema is the result of a local inflammation resulting from trauma, hot steam, acids, etc.

Inspection shows an engorged mucous membrane, swollen epiglottis, and narrowed rima glottidis. The folds of mucous membrane may overhang the glottis. The edema may be felt by the finger or seen by the laryngeal mirror.

Course and Prognosis.— The course and prognosis are directly proportionate to the severity of the underlying disease or to the amount of trauma that has been caused. Unrelieved cases of edema of the glottis often terminate fatally. The milder types, due to the infectious diseases and kidney disease, improve with the amelioration of the primary cause.

Treatment.— In mild cases attention should be directed principally to the underlying disease. Diaphoretics and diuretics are distinctly helpful. Dover's powders will allay pain and restlessness until more heroic measures are taken. Scarification is occasionally successful in giving relief when performed by a specialist. Tracheotomy is to be preferred to intubation in desperate cases when suffocation is imminent.

Laryngismus Stridulus.

Laryngismus stridulus is a neurotic disease of infancy, characterized by spasmodic attacks affecting the glottis and the neighboring laryngeal muscles.

Etiology.— Rachitic, spasmophilic infants and those with adenoids are especially predisposed. Exposure to irritating gases or vapors, or badly ventilated apartments may bring on an attack.

Symptomatology.— This varies with the severity of the disease and with the particular spasm. In some cases the spasm is but momentary, ending with an inspiratory crow: again it may recur every few moments with but slight inconvenience to the patient. In severe attacks the crowing inspiration is distinctly audible, the infant becomes spastic, and the efforts to breathe are marked. Lividity of the face and a gasping expression are observed. Carpopedal spasm and in some instances convulsions follow severe attacks. In the intervals the breathing may be quite free and unobstructed, with no constitutional symptoms. Fatal cases are rare, but have been reported.

LARYNGISMUS STRIDULUS.	SPASMODIC CROUP. (*Acute Laryngitis.*)
Ill-nourished infants under two years.	Commonly from two to five years.
No pyrexia.	Some pyrexia.
No cough or rhinitis.	Brassy cough and coryza.
Attacks momentary and recur often.	Attacks usually at night, last longer and have longer periods of remission.

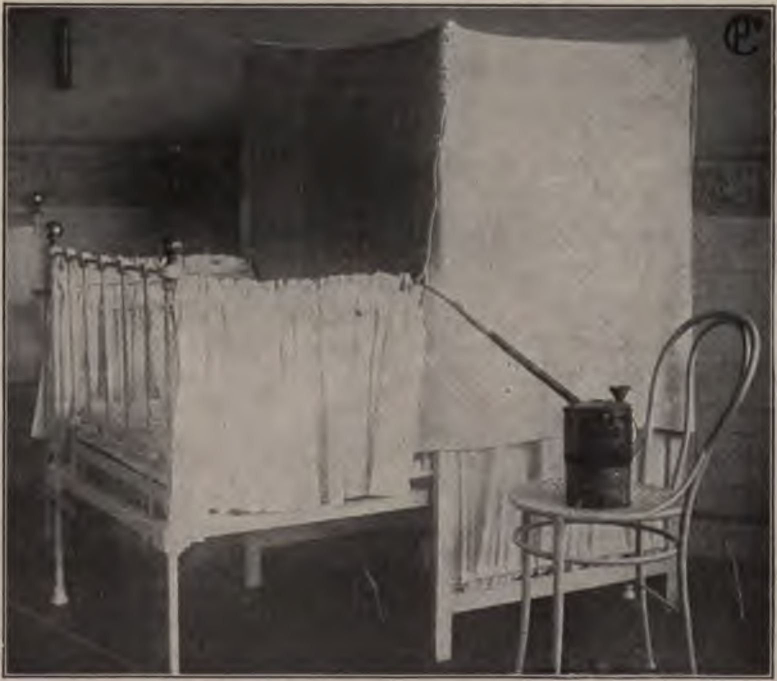

FIG. 101.— Croup tent.

Treatment.— In the severe cases, emesis with wine of ipecac in half-dram doses every half-hour until vomiting ensues may be employed, with cold sponging of the face and chest. A cleansing enema in a badly-fed rickety infant is often effectual. The underlying cause must be removed or combated in the interval. Adenoids should be removed, and the infant placed on a properly proportioned diet. This alone is curative in certain babies fed on the proprietary foods. A quiet atmosphere and a well-regulated dietary will cure the majority of cases.

Congenital Laryngeal Stridor.

(*Congenital Infantile Stridor. Thymic Asthma.*)

This congenital condition is rare and is often confused with laryngismus stridulus.

Etiology.— There is still confusion as to the causation. One theory is that it is due to a poorly coordinated action of the respiratory muscles involved in the act of breathing. The epiglottis is deformed as a result, and inspiration then produces the peculiar crowing respiration of the affection. (Thomson.)

Sometimes a narrowed, infolded and thinned-out epiglottis is found which can be observed by laryngoscopic examination to cause the peculiar sounds. Variot claims that the condition is found in the lymphatic diathesis and that it is caused by an enlarged thymus, his observations being confirmed by *X*-ray examinations. Others believe it to be a pure neurosis dependent upon an underlying nutritional defect.

Symptomatology.— From birth there is heard mainly on inspiration a high-pitched rasping croak; with expiration this is heard only with difficulty or not at all. Crying or excitement of any kind increases the stridor and even retraction of the thoracic spaces. On the other hand, it is rarely audible during quiet sleep. The voice is not affected even in crying. There is no cyanosis produced by obstruction.

Diagnosis.— This is founded upon the inspiratory stridor present since birth in a child otherwise unaffected as to development and who is not made sick or uncomfortable by the condition. Laryngoscopic examination or a direct examination of the epiglottis can be quite often made in infants with a correctly-shaped tongue depressor. Laryngismus stridulus (p. 341) is found mainly in rachitic children, is rare before the dentition period, and is often associated with tetany. New growths of the larynx should be ruled out by careful examination.

Course and Prognosis.— Up to the end of the first year the condition is at its worst; then amelioration begins, and at the second year it quite disappears. The physical condition is not affected, but superadded diseases of the respiratory tract are apt to have a fatal issue.

Treatment.— The condition does not lend itself to any form of treatment, but the intubation tube and instruments for tracheotomy should be on hand if any respiratory disease complicates it.

New Growths of the Larynx.

PAPILLOMATA.— Although by no means common, they are not rare. They may be congenital or attributed to the specific fevers. Distinct continued hoarseness is the prominent symptom. As the growth later on causes obstructive symptoms, dyspnea or suffocative attacks follow.

The diagnosis may be made or confirmed by the direct method, using either the instruments of Jackson or Bruning.

The latest method for work in the larynx is that of Killian suspension laryngoscopy. A case may be suspended for one-half or three-quarters of an hour. Rectal anesthesia should be used in this type of work.

For the examination of the trachea and bronchi we have the Jackson instrument, a hollow tube with an electric lamp at the distal extremity, or the Bruning instrument, slightly modified by Kahler of Vienna. This last instrument has a universal handle to which various sized tubes can be attached for direct examination of the larynx, trachea, bronchi, esophagus, and stomach.

The Bruning type of instrument has its warm advocates, the main advantage being successful and continual illumination at the end of the tube. The small lamp at the end of the Jackson tube is too easily covered with blood, mucus or pus.

CHAPTER XXIV.

DISEASES OF THE LUNGS AND PLEURA.

Acute Bronchitis.

This is an acute inflammation of the mucous membrane of the large and medium-sized bronchi. It is a frequent disease in early life.

Etiology.— Bronchitis results as an infection following lowered resistance from exposure, malnutrition, rickets, enlarged tonsils, adenoids, valvular disturbances, or following the infectious diseases. Irritating gases or dust particles may also cause a form of bronchitis. The bacteria found in the secretions are many and varied and of the types commonly found in the bronchial tract.

Symptomatology.— The symptoms usually begin with a coryza, or follow an obstinate rhinitis or tracheitis. There is a hard, dry cough which soon becomes loose as more mucus is produced. The pulse and temperature are slightly elevated, rarely over 101° F. during the day but may be a degree or two higher in the evening, while the respirations are always higher than normal. The child, as a rule, does not complain and may be quite willing to be about; infants, however, are often restless and irritable and vomiting may result from an attack of coughing. The stools are rarely normal, either constipation or loose stools being observed. It must be recollected that the sputum is swallowed by infants and children up to five years of age. The disease tends to recovery in from five days to a week. Severer forms are seen which are due to involvement of the smaller bronchi (formerly termed capillary bronchitis) in which the symptoms are more pronounced and there is some dyspnea. The pulse and respiratory ratio may be somewhat disturbed and a pneumonic process result from infection of the alveoli.

Physical Signs.

Inspection.— Breathing is quickened, and there may be recession of the softer parts of the chest wall, especially in rickety children.

Percussion.— No changes from the normal.

Auscultation.— Exaggerated puerile breathing and râles of varied character, according to the location of the inflammation, are found. Large, coarse râles (ronchi) over the larger tubes and moist râles with finer râles over the smaller bronchi may be noted.

Tactile fremitus is often distinct in infants when the secretions are viscid.

Diagnosis.— The differential diagnosis is to be made from bronchopneumonia, in which the temperature is higher with a disturbed pulse and respiration ratio, by the grunting respiration and dyspnea. The physical examination does not elicit dullness and subcrepitant râles as in pneumonia. In pulmonary collapse there is dullness on percussion and absence of respiratory murmur and subnormal temperature.

Prognosis.— This is usually good except in cases of rickets and after the infectious diseases, when pneumonia is likely to follow. Young infants, however, may die from a simple bronchitis when the tubes become obstructed with mucus, cyanosis and cardiac failure resulting.

Treatment.— Rest for the patient and fresh air are necessary requirements. A change to a dry climate will often alone effect a cure. The bowels should be opened with a grain of calomel in divided doses or one or two drams of castor oil. The diet is to be restricted and water freely given. If the temperature is unduly high and is causing discomfort, an alcohol rub is indicated. The use of hot poultices and jackets are mentioned only to be condemned, and the same may be said of the so-called syrupy cough mixtures. If the secretions are persistently dry and the cough harassing, the Liq. ammonia anisatis in 3 to 5 drop doses in water to a child of five years or in the following mixture will prove useful, and will not disturb the digestive apparatus.

℞	Liquor ammonii anisatis.	ʒj
	Potassii iodidi	gr. iv
	Glycerini	℥ss
	Aquæ .... q.s. ad.	℥ij

Misce et signa.— ʒj every three hours.

The aromatic spirits of ammonia in five to ten drop doses, diluted, is also effective.

Do not give muriate of ammonia to children. If at night a sedative is necessary to allow the child to sleep, appropriate doses of any of the following drugs may be given: Codein, Tincture opii camphorata, Antipyrin, or Sodium bromid.

The room is to be kept well ventilated and the temperature preferably not above 70° F. An enforced rest in bed with no further treatment than a free catharsis is often alone curative. If the child has adenoids and enlarged tonsils, these should be removed at a later date to prevent subsequent attacks.

Chronic Bronchitis.

Etiology.— This may result from repeated attacks of the acute form. Children suffering from disease of the heart, kidneys, or liver are prone to pulmonary congestion, and thus acquire a chronic bronchitis.

Rachitic children, those with a tendency to lymphatism and adenoids, and those with a tuberculous diathesis are often afflicted with chronic bronchitis.

Symptomatology.— Fever is rarely observed and the child is not incapacitated from its play. The cough [illegible] staken for pertussis, and is worse at bedtime and upon arising. Older children expectorate an abundant frothy mucoid secretion, while younger children may swallow or vomit it.

The physical signs are more marked when there is an accumulation of mucus and almost disappear in the quiescent stage. During the warmer months the cough may entirely disappear.

Diagnosis.— From pertussis the differential diagnosis is made by the course and the paroxysmal attacks followed by vomiting. Tuberculosis may be differentiated by the tuberculin tests, the absence of fever, and the physical signs.

Prognosis.— The prognosis bears a distinct relation to the etiological factor. If this can be remedied, as adenoids for example, much improvement may be expected. If there is glandular enlargement present or a tuberculous tendency, the outcome is not as hopeful.

Treatment.— First remove if possible the underlying cause. Climatic treatment is often productive of good results. Tonics such as the syrup of the iodid of iron and cod-liver oil are serviceable. Carbonate of guaiacol in 3 to 5 grain doses in sugar of milk is beneficial for the cough.

Pulmonary Collapse.

Collapse of small areas of the lung occurs frequently and quite easily in infancy. The condition may occur in cases of bronchitis and in obstruction or stenosis of the upper respiratory tract or of the bronchi.

Children with rickets are particularly predisposed, as the condition is dependent upon the yielding nature of the thoracic walls in early life.

Symptomatology.— Superficial areas cannot be detected by physical examination, nor do they produce any noticeable symptoms. Larger areas give rise to very marked and sudden symptoms. The child's condition suddenly changes to one of cyanosis; his restlessness is dependent upon the inability to get air; the breathing is extremely shallow and gasping; the supraclavicular spaces show marked recession with each effort of breathing. A fatal issue may be preceded by convulsions.

Physical Examination.— Dullness, or dullness to flatness, over the collapsed area is noted. On auscultation, the breath sounds are entirely absent. The crying voice is diminished. Areas of compensatory emphysema are present, usually in the upper portion of the chest. These signs, with the history of sudden onset, in a child suffering from a previous pulmonary condition, should cause no confusion in the diagnosis.

Treatment.— A full hot mustard bath followed by artificial respiration may be employed in desperate cases. Holding the infant by the heels may succeed in producing an effort at deep inspiration, and will dislodge any considerable amount of mucus that may have acted as the cause of the collapse. The production of emesis by the introduction of the finger in the throat should be tried. If the secretions are still found to be considerable in amount after amelioration of the collapse, a hypodermatic injection of atropin sulphate 1/300 gr. will be efficacious. A trained attendant should be placed in charge.

Emphysema.

Emphysema in some degree occurs very frequently in infants and children suffering from bronchial affection.

Acute emphysema occurs most frequently in bronchitis, bronchopneumonia, pertussis, stenosis of the larynx, and pulmonary collapse. It is produced by overdistention of the weak elastic tissue of the alveoli when the glottis is closed in violent efforts of coughing.

Children suffering from chronic bronchitis frequently have an accompanying emphysematous condition which does not recede until some time after all evidences of the bronchitis have disappeared.

The condition of chronic emphysema is not often seen in childhood. The diagnosis is based upon the abnormally full and rounded chest, the hyperresonant note on percussion, the diminution of the area of relative cardiac dullness and the sonorous and sibilant râles heard all over the chest with unduly prolonged expiration.

The prognosis and treatment are mainly those relating to the underlying conditions.

Bronchial Asthma.

This is a disease not common to early life and is due to a spasmodic contraction of the bronchial tubes as a result of some form of pathological stimulation of the bronchial muscles.

Etiology.— Salter records 225 cases, among which 11 began the first year of life, and 60 as occurring from the first to the tenth year of life.

Bronchitis is, in the majority of instances, the predisposing disease. Nasal obstructions, especially adenoids, are important etiological factors. They were present in 47 per cent. of La Fetra's cases. The relation of asthma to various forms of protein poisoning must not be forgotten. Egg white, *e.g.*, causes acute asthmatic attacks in some children, usually with evidences of a mild anaphylaxis.

Symptomatology.— The attack may begin with a fairly pronounced bronchitis which lasts for several days; then there may be suddenly superadded dyspnea with its accompanying rapid respiration, anxious expression, and rarely cyanosis.

Inspection of the chest during the paroxysm shows retraction in the suprasternal and supraclavicular spaces, and the activity of the accessory muscles of inspiration.

Auscultation.— Sibilant and sonorous râles are heard both during inspiration and expiration all over the chest.

Percussion.— A hyperresonant note is elicited during the height of the attack. There is rarely any temperature unless the attack has closely followed an acute bronchitis. It rarely rises above 102° F.

Blood examinations may be of assistance from the standpoint of differential diagnosis. Polymorphonuclear eosinophiles are increased in number, while in prolonged subacute cases a relatively lower eosinophilia is found. Scarification as for the von Pirquet test and the introduction of a small quantity of egg albumin into the site will result in a wheal if the case is one of egg anaphylaxis.

Treatment.— Adenoids, enlarged tonsils, and other obstructions to proper breathing must be removed. Attacks of bronchitis are to be guarded against. A careful process of hardening by hydrotherapy or a change of environment may be necessary to prevent repeated attacks. Careful oversight of the diet must be observed and indigestion avoided. The sugars and meats are the principal offenders.

The indication for the treatment of the acute attack is the relief of the bronchial spasm. For this purpose a combination of the iodids and bromids is of distinct service. The bowels should be emptied with a soapsuds enema, and if there is any history of indiscretion in diet, an emetic dose of the wine or the syrup of ipecac given.

Atropin 1/500 of a grain for a two-year-old child may be necessary for relief in severe cases. The syrup of the iodid of iron is valuable following the attack.

Acute Bronchopneumonia.

(*Lobular Pneumonia, Catarrhal Pneumonia, Capillary Bronchitis.*)

This is perhaps the most common disease of infancy and is very often a secondary manifestation.

Bronchopneumonia occurs most frequently in early life, and is secondary to an involvement of the bronchial tubes.

It is most often met with during the first two years of life, and is rarely seen after the sixth year. Bronchitis, the infectious diseases, especially measles, pertussis, influenza, diphtheria, and scarlet fever, are the predisposing causes. Children with rickets, marasmus, syphilis, nephritis, and gastroenteritis, especially if they live in bad hygienic circumstances, have their resistance lowered, and are thus predisposed. Infants in asylums and institutions are especially prone to the affection. The pneumococcus of Fränkel, Friedlander's bacillus, strepto- and staphylococci, and the bacterial flora of the nose and mouth are the exciting causes.

Pathology.— The pneumonic areas result from extension of the inflammation through the bronchial walls and from the bronchial walls themselves into the peribronchial tissue. Thus not only the alveoli to which the bronchial tubes lead are involved, but also those which surround the tube. The alveoli become invaded by the bacteria and distended with white blood-cells, and contain some fibrin and red blood-cells. The small patches soon coalesce and become the size of a half-dollar or even in exceptional instances involve the greater part of one lobe. On cut section, the bronchioles are found partly dilated and mucopurulent exudate flows out on pressure. The bronchial glands at the root of the lung may be infiltrated and an increase in the interstitial tissue is found in the older cases. Pleuritis is seen with any considerable area of pneumonia. Accumulations of fluid, small in amount, are not uncommon at autopsy.

Symptomatology.— There are few diseases in which the symptoms may be so varied as in bronchopneumonia. The following description will show how varied the symptomatology may be, and what wide differences are found in the physical signs. The disease may be ushered in with vomiting or high temperature. On the other hand, fever may be absent or extremely low throughout the disease. The temperature in characteristic cases is markedly irregular. There usually is restlessness, rapid breathing, and a cough which may be severe or scarcely noticeable. If the disease follows, as it usually does, an attack of bronchitis, all the symptoms which were present are exaggerated while the breathing becomes labored and the temperature increases. The cry is stifled and an expiratory grunt which is quite characteristic of acute lung involvement is heard. The pulse rate is much increased, rising to 120 or 180, and is small in character. The respirations are increased to 60 or 80, and the effort made to get enough oxygen is shown at the peripneumonic groove and by the dilated alæ nasi. If a considerable portion of the lung is involved, cyanosis in the lips or finger-nails is observable. The child feels distinctly sick; it may refuse food, but usually takes water eagerly. The tongue is dry and coated. The dyspnea increases, and the cough may be harassing and suppressed. The pulse becomes weaker, and the hands and feet are cold. Sleep is fitful and constantly disturbed by efforts to cough. If the disease progresses and the temperature remains persistenly high, stupor, delirium, or even coma may ensue. The pulse may become irregular. The heart action may give indications of myocardial changes and convulsions may precede a fatal termination. Improvement or retrogression of the affection is shown by a decreased number of respirations and a more normal pulse-respiration ratio. The character of the pulse improves, the infant takes 'some interest in his surroundings, sleeps more, and finally takes nourishment eagerly.

Physical Signs.— The objective symptoms vary as greatly as the subjective signs. The examiner must not be astonished if he finds signs not commensurate with the degree of prostration.

Palpation.— Little or no satisfactory information is obtained. However, the apex beat of the heart may be located and pain on handling appreciated.

Inspection.— Rapid, labored breathing is noted. The alæ nasi are dilated, and there may be some degree of cyanosis visible. Retraction of the peripneumonic groove is observed in advanced cases.

Auscultation.— Auscultation with inspection are of the greatest value. A pause between inspiration and expiration occurs, and can be appreciated if the child is quiet or sleeping. The bronchitis present will be revealed by coarse, moist râles, often sonorous in character. Subcrepitant and crepitant râles with diminished breathing heard at the end of inspiration over a limited area reveal the location of the pneumonic involvement. These are best heard when the infant is crying or during coughing. The examination should not cease without sufficiently forcible respiratory efforts on the part of the infant. Prolonged expiration and bronchial breathing are obtained when the area of the pneumonia is recent. Vocal fremitus may be heard while the child is crying, over larger areas of consolidation. The examiner must not fail to use a stethoscope with a small bell, and must not omit in his search the axillary region, for the first signs are often found there.

Percussion.— Light percussion is a desideratum. Dullness may be appreciated if present and points to consolidation. Areas giving a hyperresonant note are obtained over portions of the lung in which a compensatory emphysema has occurred.

The Important Symptoms in Detail. Temperature.— As a rule, the temperature is high in the beginning, 103° to 104° F., although periods of remission are not uncommon. The disease ends by lysis and the curve shows the gradual return to the normal. No typical temperature curve can be presented because of the intermittent and remittent character of the fever. Sudden high rises may indicate a complication or an added area of pneumonia. Marasmic infants frequently are seen with little or no fever, or they may even have a subnormal temperature.

Respirations.— The normal ratio of pulse and respirations, 1 to 3, or 1 to 4, may be so far disturbed as to reach 1 to 2.5 or 1 to 2. The severity of the dyspnea can be judged by the amount of recession at the sternal space and diaphragmatic attachments. The breathing may be irregular or simulate the Cheyne-Stokes type. Coughing or crying markedly accelerates the respirations, and if pain is present it is increased. The expiratory grunt is almost pathognomonic. It is produced in early life by only three conditions, namely, pneumonia, pleurisy, and a very acute indigestion. In rachitic children the respirations are especially increased and extremely shallow.

Heart and Pulse.— The pulse is small and frequent. When the temperature is high the pulse may be as rapid as 180 to 200. Its numerical value is not of as much moment as the character of the pulse compared to the action of the heart. The second sound is often accentuated, and anemic murmurs are heard during convalescence.

Digestive Tract.— Especially to be feared is the distention of the abdomen with gas. The meteorism impedes the movements of the diaphragm and adds greatly to the discomfort of the infant. Vomiting is often one of the initial symptoms. Diarrhea is more frequent in the nursling, while constipation is the rule with the artificially fed.

Cerebral Symptoms.— Occasionally stupor is seen from the first day of the disease. A convulsion may usher in the disease or purposeless movements may appear at any time in its course. Meningitis may be in consequence suspected. True symptoms of cerebral involvement may precede a fatal termination. The ear should be examined in suspected cases, and lumbar puncture made for purposes of verification.

Clinical Forms of the Disease.— Disseminated bronchopneumonia is the form in which there are small areas scattered over different parts of the lung. They do not coalesce, and varying physical signs are found in the several patches. The *asthenic form* is frequent in marasmic or rachitic infants, and it generally accompanies a gastrointestinal infection. There is little or no fever in this type, and the course is protracted and often ends in death.

Bronchopneumonia Complicating the Infectious Diseases.— WITH PERTUSSIS.— To the symptoms of bronchitis present are added the objective signs of a pneumonia usually of the disseminated type. The temperature rises abruptly and often to 105° F. The dyspnea is marked and cyanosis appears early. The complication seriously affects the prognosis. Tuberculosis may follow in its wake if the child recovers. The course is usually long and tedious, remissions being very common. During the course of the pneumonia the spasmodic or paroxysmal character of the cough is not so marked as in uncomplicated pertussis.

WITH MEASLES.— If, after the eruption of measles when the fever has subsided, there is an abrupt rise of temperature and on physical examination there are found crepitant and subcrepitant râles over localized areas, bronchopneumonia may be diagnosticated. The cough is increased; it is more frequent and dyspnea is more marked. The pulse and respirations are increased. The somnolent and apathetic state is again present.

WITH DIPHTHERIA.— The pneumonia is more apt to occur in cases having laryngeal involvement, especially those which have necessitated operative interference. It is one of the commonest causes of death after intubation. Bronchiectasis or pulmonary abscess may develop in the more chronic forms.

WITH OTHER EXHAUSTING DISEASES.— As a terminal infection, bronchopneumonia may occur in a variety of diseases common to childhood, more especially those that are of bacterial origin, such as typhoid and gastroenteritis. Where a general sepsis is present, it is sometimes only discovered at necropsy.

Complications.— As has been stated above, the disease is in itself mainly secondary to some other process. During its course there may develop an involvement of the ear, heart, peritoneum, pleura, or meninges. Following cases of delayed resolution, brochiectatic cavities, abscesses, and fibroid changes may develop.

Differential Diagnosis.— From acute bronchitis it may be distinguished by the milder symptoms, the lower grade of temperature and pulse, and the less disturbed pulse-respiration ratio. No localized area of bronchial breathing, bronchophony, or fine crepitant râles will be found. Instead there will only be present numerous coarse and fine bronchial râles.

FROM LOBAR PNEUMONIA.— If occurring in an infant, and there is a history of a primary infectious disease, bronchopneumonia is rather to be suspected. In the lobar type the temperature is more constantly high and drops by crisis, while the course is invariably shorter. The physical signs may not be distinctive until consolidation has taken place. Leukocytosis is higher and persists until the temperature falls at crisis.

FROM TUBERCULOSIS.— A bronchopneumonia of long duration is often regarded as a tuberculous process. It is to be differentiated by the tuberculous aspect of the child, the greater wasting and possibly by the signs of tuberculosis elsewhere. A negative von Pirquet test is of value in differentiation.

Course and Prognosis.— The course varies from two to six weeks, as a rule, and only rarely ends by crisis, lysis being the rule. A pneumonia superimposed on gastroenteritis or other debilitating diseases is apt to be prolonged and to leave the child in an extremely emaciated and asthenic condition. This is always a very serious disease. The prognosis is always unfavorably influenced when it complicates poorly nourished infants with infectious or constitutional diseases. The younger the child the more unfavorable the prognosis. Artificially fed infants in institutions and those with rickets or whooping cough must be regarded as especially unfavorable. The signs upon which the practitioner may base a favorable prognosis are undisturbed heart sounds, absence of marked dyspnea, willingness to take nourishment, and undisturbed gastrointestinal tract. On the contrary, if vomiting and diarrhea, irregular breathing, meteorism, and cerebral symptoms develop, the outlook points to a fatal issue.

Treatment.— The high mortality of this disease will be reduced if the disease is treated rationally. The vital resistance of the infant must be supported or increased so that the self-limited disease may terminate favorably. Fresh air, proper diet, hydrotherapy, and stimulation, when appropriately used, will conserve the resisting powers. Anti-pneumococcic sera are worthless unless prepared for the particular type of pneumococcus present.

Aerotherapy.— The patient should be placed in its crib in a large sunny room, the windows of which are opened to admit an abundance of fresh air. Light and warm clothing should be worn in the colder months, hot-water bags or an electric thermophor being placed at the child's feet if the extremities are cold. A screen may be used to shield the patient from a direct draught.

The **diet** should be a modification of the previous feedings. With the breast fed, reduce the intervals and give water before nursing. The food of the artificially fed should be reduced with gruel. Older children are allowed milk, gruels, broths, albumin water, and orangeade.

The **temperature** should be controlled by hydrotherapeutic measures if it is causing unrest, insomnia, or cerebral symptoms. A temperature of 104° F. in one infant may cause less distress than a temperature of 101° F. in another child. A daily cleansing bed-bath should be given in all cases. The milder measures for the reduction of temperature should be first attempted,— for example, an alcohol sponge-both (one part to four) will usually reduce the temperature a degree or two, and also has a tonic effect upon the patient. The water may be luke-warm, but its alcoholic strength may be increased if the desired effect is not obtained. The naked infant is wrapped in a flannel blanket and one portion of the body after another is sponged, and by gentle friction the liquid made to evaporate, and thus the cooling effect is obtained. Such a bath should take from ten to twenty minutes and is often followed by relaxation and a refreshing sleep. Compresses wrung out of water at 90° F. may be placed about the chest and renewed hourly almost without disturbing the patient. The cool pack will be required in sthenic cases with high temperature and delirium. Ice-bags to the head, while effective in reducing temperature, are dangerous unless cautiously employed under the direct supervision of a competent nurse. Weak, badly nourished infants or those with a subnormal temperature are preferably given a hot mustard bath with the water at 105° F. A cheesecloth bag containing an ounce of mustard is drawn through the water and the infant is removed when the skin reddens from the counterirritant.

Local Applications.— Mustard pastes are especially effective in the beginning of the disease and should be applied directly over the affected area in the strength of one part mustard to six or seven of flour. Directions should be given as to the size and frequency of the application. When the skin is well reddened the application should be removed. If the area becomes blanched within four hours a second application may be made. Warm poultices and oiled silk jackets are only mentioned to be deprecated.

Medication.— No drug, however harmless, should be prescribed without a distinct indication. The symptoms will in greater part be relieved by sponging and local applications. If the bowels are constipated an initial calomel purge in divided doses or an enema may be given. Sedatives for the cough as a routine measure, especially in the form of syrups, tend only to produce fermentation and retard progress. A stimulating expectorant in the form of the ammonia preparations, as the aromatic spirits or the Liq. ammoniæ anisati, will promote freer secretion if required and also tend to support the heart. A harassing purposeless cough which prevents sleep can be profitably controlled with small doses of Dover's powder (½ gr. to one-year-old child, q. 4 h.).

Judicious stimulation of the heart is one of the most essential parts of the treatment. The physician must be guided by the action of the heart when the child is quietly sleeping. A rapid feeble pulse rate, weakness of the heart sounds, and signs of failing compensation are indications for drug assistance.

Strychnin well meets many of these indications, unless the nervous symptoms are a prominent feature. One three-hundredth of a grain may be alternated with another suitable cardiac stimulant every four hours for a year-old infant. The tincture of strophanthus in drop doses every three or four hours is an effective remedy having no ill effects on the digestive tract. Alcohol in the form of brandy, if used at all, should be given well diluted, but never continued for any length of time, as nausea or vomiting almost invariably results. Camphor (grs. 1 to 10 minims of sterile olive oil) should be used hypodermatically in desperate cases. If the stomach does not retain food or medication, the needle must be used if stimulation is imperative.

Hypostatic Pneumonia.

This form of pneumonia is found as a secondary affection in many poorly nourished children, and especially in those who are brought to children's hospitals for treatment. It is no doubt a result of lowered vital resistance. The post-mortem examination shows an area of dark solid or semisolid lung tissue along the posterior borders of the lung, which on cut section is dark, grumous, and edematous. A serosanguinolent fluid exudes on pressure. The symptoms are those of a low-grade pneumonia.

Treatment.— Combat the accompanying asthenia with stimulants, such as strychnia and caffein, and treat the original condition. All such children need particularly to be removed for a few hours from the sick-room and their position in the crib is to be frequently changed. They often breathe better if the chest is elevated on a pillow.

Lobar Pneumonia.

(*Croupous Pneumonia.*)

A pneumonia affecting a lobe or a considerable part of a lobe and is caused by the diplococcus of Fränkel.

Etiology.— This form is commonly seen in children of three or more years of age and is not as rare as has been thought in the second year of life, and is rarely secondary, as is bronchopneumonia.

Pathology.— The apices are in our experience more frequently first affected in children, and then the bases. The disease passes through the four stages just as it does in adults; *i.e.*, congestion, red and gray hepatization, and resolution.

Symptomatology.— The onset is sudden, most frequently with a chill or chilly feelings or convulsions, followed quickly by high fever and rapid breathing. In some cases the nervous symptoms mask the pulmonary condition, simulating meningitis. The temperature rises to 103° or 105° F., and remissions are only slight and usually take place in the morning. The pulse is relatively high and full. In severe cases the prostration is complete, with delirium and semicoma. The child refuses food, is thirsty, and may complain of pain on coughing, or of abdominal pain. The cough may be slight or even absent for a few days, but toward the end is quite marked. In older children rusty sputum is sometimes observed. The disease ends by a crisis, but this is not always sharply defined. It may end also by pseudo-crisis or lysis, especially in those children who have previously been enfeebled.

Physical Signs.— Inspection.— Flushed face, dilating alæ nasi, and rapid respirations.

Auscultation.— Bronchial breathing is noted in the early stages and later fine subcrepitant râles; when resolution takes place, bronchovesicular breathing and many moist râles may also be present.

Percussion.—Dullness over the affected area diminishing as the disease progresses and resolution takes place.

Palpation.— Increased fremitus.

Complications.— More or less pleurisy of a dry character is present in nearly every case. Meningitis or meningismus is often secondary in the grave or fatal cases. Otitis is not rare, while pericarditis and peritonitis are sometimes seen. Empyema should always be considered if convalesence is protracted.

Diagnosis.— The sudden onset, more constant high fever and physical signs of consolidation differentiate it from a bronchopneumonia. A centralized pneumonia is often puzzling and causes a suspicion of typhoid fever or malaria. A blood examination will then assist the diagnosis. In the central pneumonia the process is enclosed in healthy lung tissue, and the physical signs may not appear for several days, but the rational signs plus the fairly characteristic symptoms will fix the diagnosis. The pain referred to the abdomen has led to a mistaken diagnosis of appendicitis. Examine the lungs particularly for a centralized process.

Prognosis.— The prognosis is very good.

Treatment.— This has already been spoken of under bronchopneumonia. It is essentially the same, but may be more vigorously pursued, as the cases are generally of a more sthenic type. Complications by extension into the ear must be guarded against. Repeated examinations of the eardrums may be necessary.

Pleurisy.

DRY PLEURISY.— This is an inflammation of a localized area of the pleural surface, usually in conjunction with a pneumonic process, over infarcts or extension from a tuberculous pneumonia. These lesions are seen frequently post-mortem; the pleural surface is found to be dull and lusterless with the adhesions firm or fibrinous.

Symptomatology.— To these adhesions the pain accompanying a pneumonic process may be ascribed (a pleuritic friction rub is heard on auscultation over the consolidated area).

The pain is sharp and lancinating, and usually produced or noticed after coughing. In older children it is evidenced at the end of a deep inspiration.

Treatment.— Outlined under Serous Pleurisy.

Serofibrinous Pleurisy.

This form also results from extension of infection from a tuberculous or pneumonic process. The fluid is usually found to be sterile on ordinary culture media, but in cases in which perfected methods have been employed the tubercle bacilli may be found.

Infants rarely have this form of pleurisy; it is more commonly found after two years of age. The weight of opinion inclines to the belief that previously infected bronchial lymph-glands are the source of infection.

Pathology.— On the surface of the pleura is found a fibrinoplastic exudate, sometimes thick, but usually thin and soft. The fluid which exudes is yellow or yellowish-green in color. The lung may be found collapsed in whole or in part. Sacculated effusions of serous fluid are not as common as the purulent. The bases of the lung form the common site; occasionally both bases are affected simultaneously.

Symptomatology.— For several days there is fever, cough, chilliness and more or less pain referred to the chest. Gradually the child is seen to play less, is listless and apathetic. The temperature is irregular, fluctuating from 101° to 102° F. Difficult breathing is now apparent. The pain, it should be recollected, may be referred to the abdomen. Headache, constipation, and coated tongue are usual manifestations. The respirations and pulse are accelerated, but the ratio is not seriously disturbed unless the effusion is large. In the latter event pain is usually diminished or absent. Loss of flesh is now apparent, dyspnea is marked, and the child prefers to lie on the affected side.

Physical Signs.— Inspection.— Movement may be impaired if the effusion is large. The cyrtometer may show greater measurement on the affected side.

Palpation.— Vocal fremitus is diminished in large collections.

Auscultation.— The respiratory murmur is diminished and bronchial breathing, distant in character, may be heard, and over the base all breath sounds may be absent. The breath sounds, if heard at all, diminish from the spine toward the axilla. Friction râles may be heard at or above the fluid in older children. The vocal resonance is diminished over the fluid itself, but does not assume the characteristics observed in adults.

Percussion.— A dull or dull to flat note is elicited by percussion, together with a sense of resistance to the percussing finger. Above the fluid a tympanitic note may be heard.

Large effusions may displace the heart, liver and spleen especially in older subjects. Aspiration confirms the diagnosis. (See article on Empyema, p. 357.)

Prognosis.— The fluid has a tendency to spontaneous absorption, provided purulent changes do not take place, and death rarely results from the effusion itself. The prognosis is unfavorably influenced if the fluid is due to a tuberculous focus.

Treatment.— Rest in bed is imperative. If the fluid is small in amount, free bowel action, plus the use of diuretics as the Liq. ammonii acetatis with a moderately dry light diet, may suffice for a cure. In large effusions, aspirate at once, then follow the plan outlined above. The Liq. ferri et ammonii acetatis serves very well as an after-treatment combined with a life in the sunlight and fresh air. Aspiration should be performed according to the directions given under empyema on page 358. If the effusion is copious a Potain aspirator or the siphonage method advocated by Huber will be found advantageous. (See Fig. 103.)

Empyema.

Empyema is known to be much more frequent, both relatively and absolutely, in infancy and childhood than in adult life. Statistics show us that 40 per cent. of pleurisies in infancy and childhood are purulent, while only 5 per cent. result in a suppurative pleuritis in adults. Yet in spite of this fact it has been mainly studied pathologically and clinically from adult life.

The great majority of cases of empyema follow lobar pneumonia in children. Although the infectious diseases and pyemia may be complicated by it, some inflammatory process in the lung or pleura has generally preceded the suppuration.

The pneumococcus we find present in the greater number of cases in almost pure culture. The staphylococcus and streptococcus occur in cases from which thin pus with little fibrin is withdrawn. We are as yet uncertain as to the number of cases due to the tubercle bacillus: as this organism is difficult to find in the exudate, and is often reported as absent when the subsequent course would clinically stamp the case as of the tuberculous variety. Bovaird believes that six per cent. of all cases are tuberculous.

The pus found in the average case of empyema is quite thick, creamy and odorless, with masses of fibrin of varying consistency floating in it. The fluid exudes quite slowly at first, and there is in the beginning an attempt made by nature to wall off this fluid by fine adhesions, with the result that small pockets or sacculations are formed; as the fluid accumulates in greater quantity, these septa are broken down and merged, and thus the fluid may fill the entire pleural cavity.

Sacculation is frequent in children, and it is important to be able to recognize the condition at this stage, and treat the case early before much damage has been done. The fluid in cases of pleurisy with effusion slowly becomes slightly turbid, then seropurulent, and finally assumes pure pus characteristics; this change being accompanied by a corresponding increase in the number of bacteria present.

A study of the charts of the empyema cases at the Post-Graduate Hospital in New York shows that the empyema develops about the fourth week after pneumonia, and that the average amount of pus is small (5 to 8 oz.). The most frequent complications were peritonitis, meningitis, pericarditis, and sepsis.

Symptomatology.— If, in a case which has recovered from a pneumonic process or from an infectious disease, there is not a steady improvement in physical well-being, but instead a low-grade temperature, with increased number of respirations, accompanied by a slight hacking cough, pallor, sweating of the head, steady emaciation, and a marked leukocytosis, suspicion should be directed to fluid in the chest.

In spite of these warning rational signs there is probably no other equally great pathological change anywhere in the body so often unsuspected or overlooked.

The physical signs of fluid in the chest of infants and children differ grossly from those of the adult. In the examination the possibility of encapsulated or sacculated effusions must be kept in mind which, as has been pointed out, may contain but little pus and still give marked subjective symptoms. In infants the chest may contain fluid and we may still obtain practically normal breath and voice sounds.

Confirmatory physical signs above the fluid, at the level of, and over the fluid cannot always be obtained in young patients. Ellis' curve and obliteration of Traubes' space cannot be depended upon for assistance. Skoda's resonance may or may not be present.

The main signs upon which reliance must be placed are *marked dullness or flatness on percussion* over any area usually resonant, bronchial breathing, and *marked resistance to the percussing finger,* as distinguished from a corresponding point on the opposite side. These physical signs, coupled with the rational signs above enumerated, should be sufficient justification for the introduction of the needle. An early diagnosis is of the utmost importance, and no diagnosis of empyema should be regarded as complete without exploratory puncture. If in addition to these physical signs we can elicit bronchial breathing over the area of flatness; relative immobility of the affected area and bulging, with displacement of the apex beat — then omission to puncture would be unjust to the patient.

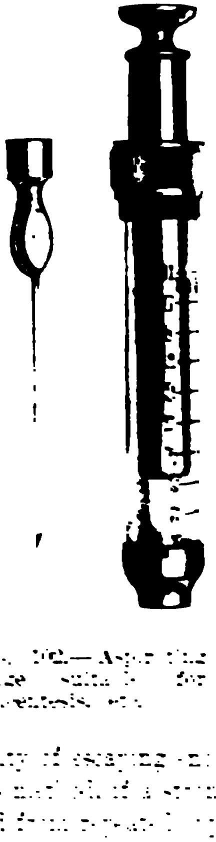

FIG. [illegible].— Aspirating syringe suitable for thoracentesis, etc.

Exploratory Puncture.— The exploring syringe and needle should be of good caliber and length, as the pus may be thick and contain clots of fibrin. After proper sterilization of the syringe it should be tested to ascertain if it is still in good working order. The skin having been thoroughly cleansed over the affected area, and painted with iodine, the needle can be inserted somewhat above the lowest point of flatness. If the whole side is involved we can select the most favorable points; viz., in the sixth interspace in the posterior axillary line on the left side and the fifth interspace on the right side. If we keep in mind that the diaphragm rises higher in children than in adults and that the liver must be avoided on the right side we have a fair field for exploration.

With the child held in the upright position, and its arm extended above its head, we can thrust the needle directly forward — noting at the same time the amount of force necessary to penetrate the pleura and partly withdraw the plunger. If no fluid appears point the needle upward, and then if necessary downward, and you will have explored the suspected area thoroughly and avoided the possibility of escaping encapsulated pus or penetrating a thick fibrinous mass. This method [illegible] dangers, and saves the child from repeated [illegible] when we feel [illegible] certain that fluid is present [illegible] with the syringe. The X-ray may also assist in [illegible].

If possible [illegible] the exudate for bacteria, as the bacteriological findings, [illegible] of pleural [illegible] the patient [illegible] will determine the prognosis.

When a clear, straw-colored fluid is withdrawn we can afford to wait and watch for signs of recession of the fluid. If this does not occur, or the temperature curve later shows septic characteristics, puncture again, and the fluid will now probably show purulent changes. When the first exploration shows a seropurulent or purulent discharge operative interference should not be delayed.

Treatment.—Aspiration should be employed for temporary relief of dyspneic symptoms only . Incision and drainage aseptically performed under light general or local anesthesia give better results. Siphon drainage in infants and very young children as illustrated in Fig. 103 is then practised and the tubes retained until the discharge is quite moderate. The operation of rib resection is preferable in all cases of empyema except in very young infants whose physical condition warrants *any* operative interference. The general subperiosteal operation of the eighth or ninth rib in the postaxillary line is no more dangerous than incision and can be as quickly performed, especially when we recollect that in the former operation we are often obliged to pass the finger through the incision to free the fibrinous masses. By resection we secure ample drainage space, are not hindered with clogged tubes, and what is more important we hasten the time of recovery of the patient. No permanent deformity

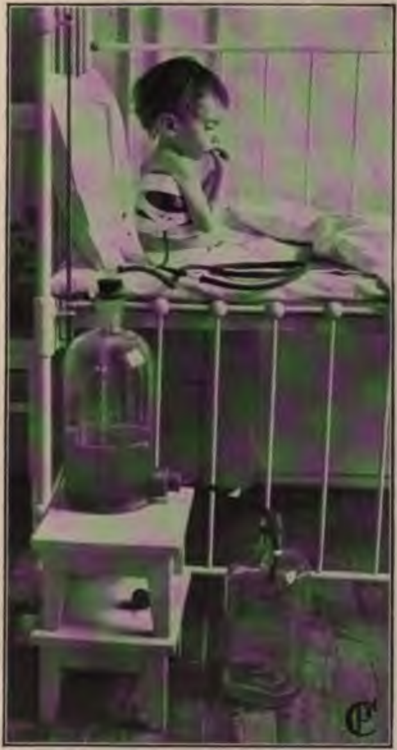

FIG. 103.—Siphon drainage after

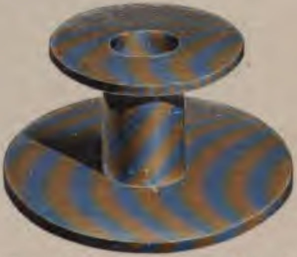

FIG. 104.—Spool made of soft rubber for drainage.

results, as it is necessary to remove only one inch of the rib and the periosteum is preserved. The mortality is reduced also to one in seven. Instead of the double drainage-tube the spool tube (see Fig. 104) of suitable size for the patient is used. This has the advantage of being least irritating to the pleural surfaces, and in action simulating a valve, allows the lung to expand with coughing efforts, and furthermore can be easily cleansed without painful removal. This tube should be removed as soon as the discharge becomes serous. The sinus will then still be fresh and tend to close, leaving surprisingly little deformity. Irrigation except in extremely fetid neglected cases is not to be employed.

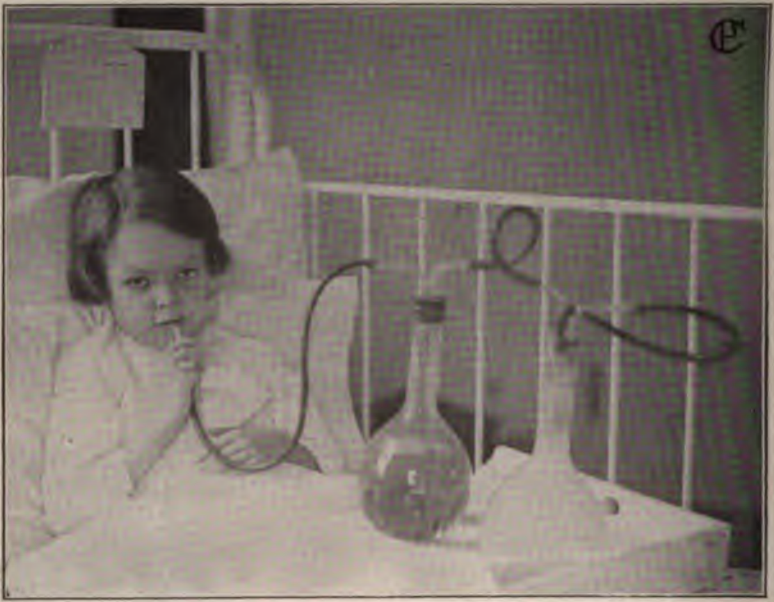

FIG. 105.— Blowing colored fluid from one bottle to another favoring lung expansion.

The dressings are pads of sterile gauze (not iodoform gauze) applied over the opening in the tube. This allows freedom of chest movements of the unaffected side and greater degree of cough impulse, thus favoring the expansion of the compressed lung. The child should be allowed to get up as soon as possible, and early encouraged to blow through some musical instrument, or to make soap bubbles. This plan, coupled with proper tonic, dietetic, and hygienic treatment, should give good results.

In long standing or neglected cases of empyema in which there are many and firm adhesions with or without collapse of the lung, Lloyd advocates digitally breaking up all the adhesions and allowing the lung on the opposite side to inflate the collapsed lung after the anesthetic has been temporarily stopped.

Pneumothorax.

Pneumothorax or air in the thoracic cavity is an exceedingly rare condition in early life. It is usually tuberculous, but may also result from traumatism, foreign bodies in the bronchi, rupture of a bronchiectatic cavity, pulmonary abscess, empyema, or caseating lymph nodes. Cases have also been reported following pertussis, diphtheritic and laryngeal stenosis.

Symptomatology.— The symptoms begin very abruptly; dyspnea, cyanosis, thoracic pain, and a rapid thready pulse being the cardinal symptoms. Percussion elicits a tympanitic or hyperresonant note, as a rule, but a dull note is occasionally obtained if the pleura is disturbed. Vocal fremitus is absent. Voice sounds are distant, and metallic succession may be obtained over the tympanitic area.

If both air and fluid are present (hydropneumothorax), the viscera may be displaced from their normal relations. One of us recently observed such a case following attempts to relieve a stricture of the esophagus. We have observed sacculated pneumothorax resulting from a pyothorax in which the onset was gradual and the symptoms proportionately less intense.

Prognosis.— This is, as a rule, unfavorable, owing to the severity of the underlying causes.

Treatment.— Absolute rest to body in the prone or semirecumbent position must be insisted upon. Stimulation and chest strapping are indicated. The recent experiments with positive pressure and the Sauerbruch box for intrathoracic operations offer some hope for surgical procedure in these cases.

Pulmonary Abscess.

This is a rare condition resulting from the invasion of pyogenic bacteria, following aspirated foreign bodies in the lung, pneumonia, pulmonary emboli, or caseating lymph nodes.

Symptomatology.— The symptoms develop slowly, following what appears to be a protracted convalescence. Often they are not distinctive in character. The emaciation is progressive, the temperature, if followed closely, shows a septic curve. Profuse sour sweating is the rule. If combined with the above description we have thick purulent sputum containing leukocytes and elastic fibers, and if on blood examination a marked leukocytosis (50,000 to 60,000 per cm.) is found, abscess of the lung should be considered and a diagnosis made by excluding tuberculosis, encapsulated empyema and gangrene of the lung. In selected cases surgical treatment may be of avail. The X-ray should be employed for corroboration.

Gangrene of the Lung.

Pulmonary gangrene is a rare condition in children, resulting from pyogenic bacteria infecting a necrotic portion of the lung. It is a secondary condition following pneumonia, the infectious diseases, bronchiectasis, the aspiration of foreign bodies, or gangrenous stomatitis. The diagnosis is more often made at necropsy than during life.

Diagnosis.— This is founded upon the putrid expectoration of a dirty greenish color, which on examination is found to contain shreds of pulmonary tissue. The child's breath is almost always offensive. There is progressive emaciation, prostration and an irregular temperature. The cough is somewhat paroxysmal, followed by the expectoration of a good quantity of the characteristic sputum.

Even young children will expectorate or vomit who are suffering with pulmonary gangrene. Following the evacuation of the pus we may be able to obtain the cavernous signs indicating a cavity. Hemoptysis sometimes follows after a severe attack of coughing.

Course and Prognosis.— The prognosis is invariably grave. Careful supervision and aerotherapy may so far improve the patient's general condition that surgical measures may be justifiably attempted with the chance of a permanent cure.

Treatment.— Until operative measures can be instituted, forced feeding, stimulation and cod-liver oil should be used. Inhalations of the compound tincture of benzoin, turpentine, or the oil of eucalyptus will mitigate the foul odor.

Bronchiectasis.

This disease results from a weakening of the bronchial wall following a number of pulmonary conditions, the most important of which are interstitial pneumonia, chronic bronchitis, emphysema, pulmonary collapse, tuberculosis, and foreign bodies. The dilatations are cylindrical or sacculated or small and diffuse, and always contain a large number of bacteria. Measles, whooping cough and influenza represent predisposing causes.

Symptomatology.— Added to the symptoms of the underlying disease, or during convalescence therefrom, the patient begins to expectorate a quantity of mucopurulent sputum. The cough is paroxysmal, and may be induced by changing the position of the patient from the diseased to the normal side. The collected sputum has a disagreeable odor, is thin, grayish-brown, and separates into a frothy, a watery, and a granular layer. The fever is moderate, as a rule, although exacerbations in which may occur high fever, night-sweats, diarrhea and pulmonary hemorrhage, are not uncommon.

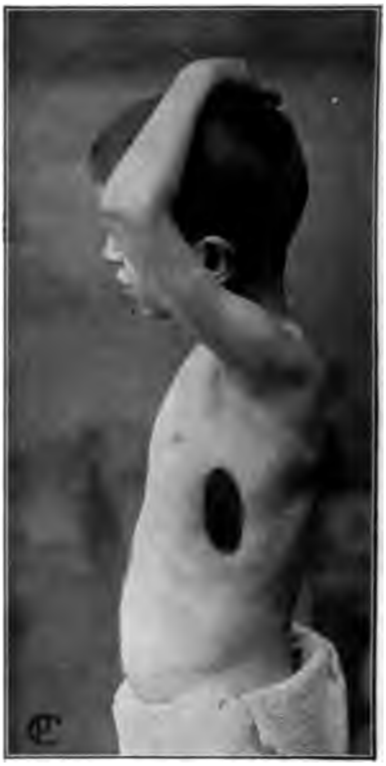

Fig. 106.— Shaded area over a bronchiectatic cavity.

Physical Signs.— In a typical case, with a well-developed cavity, cavernous or amphoric breathing with diminished vocal resonance may be heard over the affected area. After a free expectoration, numerous coarse mucous râles with bronchophony may be obtained. On percussion a tympanitic note is heard. Other evidences may be found in the clubbed fingers, emphysematous areas, or the development of a pulmonary gangrene.

Diagnosis.— The paroxysmal coughing occurring on change of position, with large quantities of expectoration, with the general condition not proportionately affected, tend to differentiate it from the more acute condition of pulmonary gangrene which causes marked prostration and shows in the sputum portions of lung parenchyma. The needle may distinguish it from abscess, and the sputum examination from pulmonary tuberculosis. The *X*-rays are of little help in this condition. Willy Meyer proposes to try insufflation of collargol into the depth of the trachea and bronchi after a very thorough expectoration, and in this way enable the radiologist to map out the involved areas.

Course and Prognosis.— The disease may extend over many months or years, but complete recovery is extremely rare. Complications are easily acquired leading to a fatal result.

Treatment.— This should be directed toward conserving the strength of the patient by the use of nourishing food and a protracted sojourn and life in the mountains or at the sea-shore. The inhalation of the volatile balsams, such as benzoin, turpentine, or eucalyptus, are indicated.

Quincke's postural method, raising the foot of the bed; or the method of expiratory compression may be used if the cavity does not thoroughly empty itself after coughing. Terpene hydrate or guaiacol carbonate may be administered internally. Resection of the ribs, collapse, and drainage of the cavity has been attempted, but thus far with indifferent results. Artificial pneumothorax has been recently tried. From this measure improvement only can be expected. Pneumectomy, or the extirpation of the diseased lobe or lobes, while a very serious operation, offers the only hope of a successful cure.

Foreign Bodies in the Respiratory Tract.

Various objects may find their way into the larynx, trachea, or even into the bronchi by accidental inspiration at the time of coughing or laughing when the foreign body is in the mouth. Among the objects we have collected are an upholsterer's tack, the glass eye of a doll, fish bones, and a carrib bean.

Symptomatology.— A sudden violent fit of coughing or choking follows the aspiration and cyanosis results; extraordinary efforts are made by the child to breathe. Occasionally the paroxysm is so slight as to be mistaken for whooping cough or croup. If the object is sharp, as a fish bone, for example, there is some local irritation or later symptoms of obstruction. The attacks may be followed by periods of comparative quiet and rest. If the object is small and smooth, and is not coughed up at once, it will eventually find its way into a bronchus. It passes usually, owing to its position, into the right bronchus.

Diagnosis.— If a history is obtained and the symptoms of the initial suffocative attack are well described, the diagnosis may be made, without the knowledge that an object has been aspirated. When the symptoms come on gradually, the diagnosis may be entirely obscured. However, a bronchiectatic cavity, pulmonary collapse, or abscesses should lead to a careful investigation with this diagnosis in mind. An *X*-ray examination may materially aid in clearing up a suspected case.

Treatment.— The finger or the laryngeal forceps may succeed in removing a recently aspirated object. If unsuccessful, tracheotomy may be necessary in cases which would otherwise suffocate, surgical measures for the removal of the foreign body being later employed.

Direct laryngobronchioscopy (see p. 342) has rendered excellent service in the removal of objects from the bronchi. The fluoroscope has also successfully directed the surgeon in locating and extracting the foreign body.

Subphrenic Abscess.

This consists of an accumulation of pus between the liver and the diaphragm on the right side, or between the stomach, spleen, and diaphragm on the left side. Downward extension of an empyema through the diaphragm is the usual cause in children, although it may result from intraabdominal disease. It may also complicate conditions such an appendicitis and acute pneumonia of the septic type. Empyema is most often diagnosticated and the real condition discovered at operation. Rarely the abscess contains air, and pyopneumothorax may be suspected.

Symptomatology.— Beside the symptoms of the primary condition there may be added chills, rapid pulse, remittent fever, localized pain and tenderness, nausea and vomiting, with impeded respirations. In a case seen by one of us there was also a moderate amount of bulging, and the liver was displaced by the pus.

Treatment.— Prompt surgical intervention with the establishment of drainage is imperative. The prognosis should be guarded.

SECTION VIII.

DISEASES OF THE CIRCULATORY SYSTEM.

CHAPTER XXV.

DISEASES OF THE HEART.

Two factors in early life contribute to the vigor of the circulation: (1) The strength of the heart muscle itself and the readiness with which it hypertrophies when compensation is required. (2) The elasticity of the arteries. It is frequently not appreciated how important a function the arteries play in the round of the circulation. By their tonicity they aid the heart in propelling the blood in a constant stream to the various parts of the body. If the arteries are healthy and elastic great help is thus afforded the heart in the equable distribution of the blood. Even a crippled

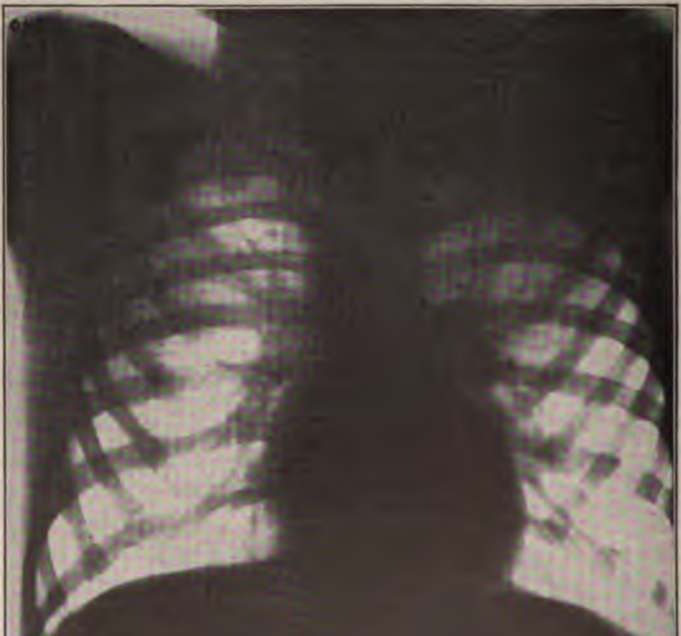

FIG. 107.— Radiograph of normal heart.

heart acts to much better advantage when the arteries can perform their full share in the work of the circulation. Thus in early life, when the arteries are nearly always in a sound condition, a lesion of the heart may produce comparatively little discomfort, especially when compensatory hypertrophy is satisfactory, as is very apt to be the case. When, however, middle age approaches and a stiffening of the arteries ensues from atheromatous change, we will soon encounter dyspnea and other evidences of a failing circulation.

The blood pressure itself, as registered by the sphygmomanometer, is lower in children than in adults. The normal limits of systolic pressure at different ages have been given as follows:

Infants,	75 to 90 mm.
Children,	90 to 110 mm.
Young adults,	100 to 130 mm.
Older adults,	110 to 145 mm.

In a series of observations made by us at the Postgraduate Hospital with the Stanton sphygmomanometer, the above figures were confirmed, and observations were made in diseased conditions; but while of interest, it was found that blood pressure estimations were not of much practical value in early life.

The Heart.

The infant has relatively a larger heart than older children and adults, and it assumes a more horizontal position from a greater breadth. The apex beat in early life is in the fifth intercostal space and is sometimes a little external to the mammary line. With increasing age the apex beat deflects a little downward and inward, reaching well within the mammary line.

Enlargement of the heart may be noted by the position of the apex beat and by an increased area of dullness on light percussion. The space for such percussion is situated between two parallel lines, one line running through the middle of the sternum and the other through the left nipple. Absolute heart dullness will be noted in a small triangle formed by the left border of the sternum, the lower border of the fourth rib and a line running from the fourth rib just within the mammary line to the third costal cartilage near the left border of the sternum. The dullness caused by the left ventricle will be marked out by percussing inward from the mammary line over the second, third, fourth, and fifth ribs; that caused by the right ventricle will be located by percussing over the fourth interspace beginning outside the right sternal line and percussing toward the sternum. Dullness caused by the apex may be noted by percussing from the middle of the sternum along the fifth interspace to the anterior axillary line.

The heart beats with great rapidity in early life and it is often puzzling to determine accurately the character of the sounds heard. The pulmonic second sound is accentuated throughout the early years and a certain arythmia is often observed. The pulse is frequently irregular and its rapidity is greatly influenced by any disturbing conditions, such as crying; it also varies much during waking and sleeping hours. The following may be considered as a fair general average:

Newborn,	120 to 140.
First year,	110
Second year,	100
Fifth to eighth year,	90

Congenital Heart Disease.

(*Cyanosis; Blue Disease.*)

New-born infants sometimes exhibit a persistent blueness, due to malformation of the heart. This defect usually takes the form of deficiency in the interauricular and interventricular septa. The great vessels may likewise be involved in the malformation, especially the pulmonary artery. Dr. J. L. Smith found in over half of the 162 cases he examined at autopsy that the pulmonary artery was absent, rudimentary, impervious, or partially obstructed. He also found the following lesions: Right auriculoventricular orifice impervious or contracted; orifice of the pulmonary artery and the right auriculoventricular aperture impervious or contracted; right ventricle divided into two cavities by a supernumerary septum; one auricle and one ventricle; a single auriculoventricular opening, with interauricular and interventricular septa incomplete; mitral orifice closed or contracted; aorta absent, rudimentary, impervious, or partially obstructed; aortic orifice and left auriculoventricular orifice impervious or contracted; aorta and pulmonary artery transposed, the vena cava entering the left auricle; pulmonary veins opening into the right auricle or into the vena cava or azygos veins; aorta impervious or contracted above its point of union with the ductus arteriosus; the pulmonary artery wholly or in part supplying blood to the descending aorta through the ductus arteriosus.

It is obvious that with any of these grave central lesions not only the peripheral circulation, but the nutrition as well must suffer. The blood is deficient in oxygen and has an excess of carbon dioxid.. The blueness is most pronounced in the prominent parts of the face, such as the eye-brows, cheek-bones, nose, and lips. The hands and fingers are also prominently affected. The color varies from a light to a very deep purple, the discoloration being aggravated by crying or other disturbing influence.

While the infants at birth may be well developed, there are soon evidences of failure of nutrition, and they are very susceptible to intercurrent diseases. The action of the heart is rapid and tumultuous, and the respiration is correspondingly disturbed. Various bruits are heard upon auscultation of the heart, especially a systolic murmur at the base. The right heart is usually enlarged. The infants suffer from lack of sufficient animal heat, and because of this and pulmonary congestion they easily contract pneumonia. They are apt to be carried off by any intercurrent disease, and whooping-cough is especially badly borne. In a majority of cases of congenital heart lesion, the general blueness is noted immediately or very shortly after birth. In a minority of cases, however, the lividity is not noticeable for an interval of time, varying from a few weeks to a few months after birth. A few cases have been reported where even a few years have elapsed before the blueness has become marked. The defect occurs more frequently in male than in female infants. While this peculiarity has been noted by most observers no explanation can be given of it. Most cases do not survive the first year, but occasionally a case will live through infancy and childhood. It is very rare to find one surviving adolescence. Those that survive infancy present a stunted appearance, although well formed at birth. The chest becomes deformed, with a projecting sternum, and the fingers and toes bulbous from the sluggish circulation. Anasarca may occur toward the end of life, to be noted in the face or ankles, and rarely in other parts of the body. Death may take place from exhaustion, during a paroxysm of dyspnea, from convulsions or from a feeble resisting power in some intercurrent disease.

Diagnosis.— In order to distinguish congenital from acquired heart disease, it may be borne in mind that the latter is rarely seen in infancy, especially early infancy. The congenital type shows early and there is general blueness, marked dyspnea, defective development with later bulbous fingers and toes. There is likewise no appearance or history of rheumatism or acute endocarditis. The commonest bruit is the loud murmur at the base.

Treatment.— A general hygienic oversight is the most that can be accomplished. The infants must be kept warm and carefully fed. If the blueness and dyspnea become extreme, oxygen may give temporary relief. Small doses of digitalis may be occasionally given as an aid to the circulation.

Acute Endocarditis.

Endocarditis is an inflammation of the endocardium which especially affects the lining membrane of the valves and the parts contiguous to them.

Etiology.— The commonest cause is the virus of rheumatic fever, and, in some cases, it may be the first and even the only manifestation of this disease. Usually, however, it is preceded by several attacks of the mild form of rheumatism seen in early life. It is also not infrequently seen in connection with chorea and repeated attacks of tonsillitis. The latter disease may alone be responsible for endocarditis or it may be associated with rheumatism, the two conditions either preceding or following the heart attack. Clinical experience forces the belief that certain forms of tonsillitis, rheumatism, chorea and endocarditis are frequently manifestations of the same underlying pathological condition. Any infectious disease may attack the endocardium, especially scarlet fever, cerebrospinal fever, diphtheria, and typhoid fever. In some cases influenza may act as a cause. Any of the septic conditions are also liable to provoke inflammation in the endocardium.

Pathology.— In fetal life the right side of the heart is attacked, but this rarely occurs after birth, when the left side is almost exclusively affected. The valves are most frequently the seat of the inflammation, the mitral valve being oftenest affected and next the aortic and occasionally the pulmonary valves. The affected valve is thickened from a proliferation of connective-tissue cells and may be covered by small deposits of fibrin, especially around the margins. Small thrombi and vegetations may also be present, which are liable to separate and be carried into the general circulation. In this manner secondary infections are liable to take place in various vital organs. Leakage of the valve may be caused by contractions of the chordæ tendinæ or ulceration with perforation of the valve. Streptococci or the staphylococcus pyogenes are the bacteria that most frequently infect and inflame the endocardium and rarely pneumococci, either from the presence of the bacteria or their toxins in the blood stream. The tonsils are also considered to be one of the primary seats of many of the bacteria that thus affect the heart, and cases of endocarditis follow tonsillitis. There is usually some inflammation of the myocardium coexisting with endocarditis which causes a softening of the heart muscle and consequent dilatation. This accounts for some of the valvular insufficiency seen during and after the attack.

Symptomatology.— The symptoms are often very obscure, being masked by the original infectious disease that is the cause of the heart lesion. On this account the heart must be frequently and carefully examined during attacks of rheumatism, scarlet fever, diphtheria, tonsillitis, chorea, and in any septic condition. A soft, systolic murmur is usually heard, most noticeable at the apex and transmitted toward the axillary region. There may be slight dyspnea and evidences of some dilatation, especially if the child cannot be kept quiet. An irregular fever with increased respiration and pulse rate will also be noted. Young children rarely complain of pain or discomfort in the cardiac region, but older children may describe a feeling of constriction, slight pain, or palpitation.

Septic Endocarditis.— The symptoms of this form of endocarditis, otherwise known as malignant or ulcerative endocarditis, are much more urgent and marked. There are chills with high, irregular fever and sweats. There is likewise great prostration, with delirium and even coma. There are no characteristic symptoms referable to the heart beside a murmur and possibly more marked dyspnea than in the ordinary attacks. Ulcerations take place on the valves, and septic emboli are liable to be detached and carried to the lungs, kidneys, brain, or other vital organs. A typical sign consists of purpuric spots or petechiæ which soon appear on the neck, chest, abdomen, or extremities. This form of endocarditis may occur in any septic condition, when various bacteria may be found in the blood and thus the cause of the heart lesion demonstrated. Fortunately, septic or malignant endocarditis is very rare in early life as it is practically a fatal disease.

Diagnosis.— A soft, systolic murmur at the apex that develops during an illness, with irregularity of the heart's action and some dilatation is suspicious of endocarditis. The murmur is transmitted toward the axilla and is usually accompanied by fever and increased rapidity of the pulse. A purring thrill may also be present and an increased pulsation over the area of the heart's action. Hemic or myocardial murmurs are inconstant, are noted especially at the base or over the pulmonic area and are not transmitted. These murmurs are usually systolic, but there is no evidence of dilatation or marked cardiac disturbance and there is absence of fever and other signs of acute illness. Pericarditis is recognized by the friction sound, dullness on percussion, or absence of distinct apex beat when effusion is present.

Prognosis.— The prognosis is good as regards life, except in the septic or ulcerative form. The outlook is not so good with reference to the future crippling of the heart from thickening or retraction of the valves. Cases have been reported, however, in which no permanent lesion has followed endocarditis, especially when the disease has been early recognized and the child kept quiet. Most of the cases, especially those of rheumatic origin, are followed by some permanent lesion.

Treatment.— Rest in bed in a recumbent position is most important during the acute stage. Any exertion that results in dilatation of the softened heart muscle will cause insufficiency. An ice-bag may be placed over the heart, and the tumultuous heart action may also be controlled by small, non-narcotic doses of opium. The latter drug will also tend to allay restlessness and thus render it easier to keep the child quiet. Grains 1/50 to 1/30 of morphin sulphate may thus do good service. If the heart's action is weak, with evidences of dilatation, strychnia or digitalis will be indicated. When any joints are involved or in the face of a rheumatic history, the treatment should be with sodium salicylate in double or treble dosage through the rectum. Aspirin or the alkalies by the mouth in milder cases.

In cases in which the kidney secretion is deficient, caffein soda benzoate, one to two grain doses, will be beneficial. The effort should be to induce a regular pulse under 100 in the child.

Carbonic acid and Nauheim baths with graduated resistant exercises are to be used throughout convalescence.

The bowels must be kept open, and a light, low protein diet given. In cases having a weak or dilated heart, with irregular pulse, it may be necessary to keep the child quiet in bed for many weeks or until a distinct improvement is noted.

In septic endocarditis blood cultures should be made twice a week in the effort of finding the organism. (This requires expert and specialized laboratory technic.) When the organism is found a homologous vaccine can be made and used according to Wright's method. Recent reports (Thompson, et al.) have been extremely encouraging in this heretofore fatal disease.

Myocarditis.

Myocarditis is an inflammation of the heart muscle followed by softening and degeneration.

Etiology.— The toxins produced by the bacteria of the various infectious diseases may cause an inflammation of the heart muscle. Diphtheria and scarlet fever are the diseases most often responsible for thus attacking the heart.

Pathology.— In some cases there is a cloudy swelling and a granular and hyalin degeneration of the muscle fibers, and in others there will be a fatty degeneration. If the latter is extensive, a cut section will show a yellowish appearance of the heart muscle. There may also be a small, round-celled infiltration between the muscular fibers.

Symptomatology.— The milder forms of the disease may show no symptoms referable to the heart. In severer attacks there will be dyspnea, faint feelings, and a rapid, irregular pulse. It is difficult to locate the position of the apex beat, and there will be an increased area of cardiac dullness due to dilatation. The grave cases show general pallor, with cyanosis of the lips and finger-tips, and a sudden collapse from heart failure may be the terminal condition. The symptoms are liable to be masked, as in endocarditis, by the primary infectious disease. Vomiting, occurring in connection with a weak, irregular pulse in diphtheria, is usually of serious import. A pulse becoming slow in an infectious disease, especially diphtheria, after having been rapid, is of grave significance. We have seen the pulse drop from 150 to 50 and 40, and, in one case, it reached 25 in diphtheria with a complicating myocarditis. Death nearly always ensues in cases having a very slow pulse. In chronic and severe valvular disease, a lack of tone in the heart muscle, due to a slow and progressive myocarditis, will be shown by failure of compensation with resulting dyspnea, congestion and enlargement of the viscera, and dropsies.

Diagnosis.— The diagnosis rests upon a weak and irregular action of the heart, a feeble first sound, and accentuation of the pulmonic second sound and difficulty in locating the apex beat. In addition to these local signs there will be faintness, pallor, and general prostration.

Treatment.— The heart must be supported by absolute rest in the recumbent position. Sudden dilatation and weakness may be combated by hypodermatic injections of small doses of morphin and atropin. Sulphate of strychnin is useful in sustaining the heart's action. Prolonged rest and avoidance of exertion must be insisted upon during convalescence.

CHAPTER XXVI.

CHRONIC VALVULAR DISEASE.

Physicians are often called upon to treat cases with valvular diseases of the heart when it is impossible to find out the beginning of the trouble. The patient may be unable to give a history either of rheumatism or endocarditis, but seeks advice for dyspnea, swelling of the extremities, or other symptoms of failing circulation. We believe that a large proportion of the cases of valvular disease in the adult started during childhood, the first beginning of the trouble, which is the period for hopeful treatment, not having been recognized. The nature of the rheumatism that attacks children is often obscure, and several attacks of wandering or so-called "growing pains" may be overlooked. While the heart may be the first structure attacked by rheumatism, this is not the common order of events. In most of our histories of valvular disease in children the cardiac affection seemed to come on after several attacks of rheumatism. Great care should be exercised in making an early diagnosis, and vigorous measures be taken to combat these first manifestations of rheumatism, fearful that, although the heart may escape the first mild attacks, it may suddenly and unexpectedly become affected by an equally light manifestation of the disease.

When endocarditis ensues, as previously noted, the symptoms are often very obscure. Palpitation, slight pain, and breathlessness, with a dry cough, may not be particularly noticed by parents. In all suspicious cases we would strongly emphasize the importance of a careful examination of the heart on the part of the physician, a stethoscope being used. Just at this juncture rest is indicated above all things. If this is not procured, the delicate, softened heart muscle quickly undergoes dilatation, followed by permanent damage to the valve. Dilatation takes place very readily in the young subject. If it is true that endocarditis need not always nor necessarily eventuate in permanent valvular disease, and this seems to be generally believed, we may certainly aid such a result by doing all in our power to avoid dilatation. By recognizing the endocarditis at the beginning and keeping the child as quiet as possible, we may thus seek to avoid dilatation and consequent crippling of the valves. Even after the immediate symptoms of endocarditis have passed, children are too often allowed to take part in all kinds of vigorous exercises as if nothing amiss had happened.

In many cases children suffering from chronic valvular disease show few symptoms of circulatory disturbance. This is explained by a more or less perfect compensation which generally and completely ensues from hypertrophy, and there may thus be no positive sign until years later that serious damage has been effected. The peripheral arteries are also healthy and elastic at this time, which fact, as previously noted, greatly facilitates the work of the heart. As the patients grow older, and vascular degenerations begin, and the limit of compensatory hypertrophy is reached, marked dyspnea and other symptoms of a failing circulation will be noted. We have seen children after a severe, neglected case of endocarditis, or after several attacks, suffer in this way, but in a large number of cases the principal evidence of valvular disease will be shown by general underdevelopment, malnutrition, and anemia.

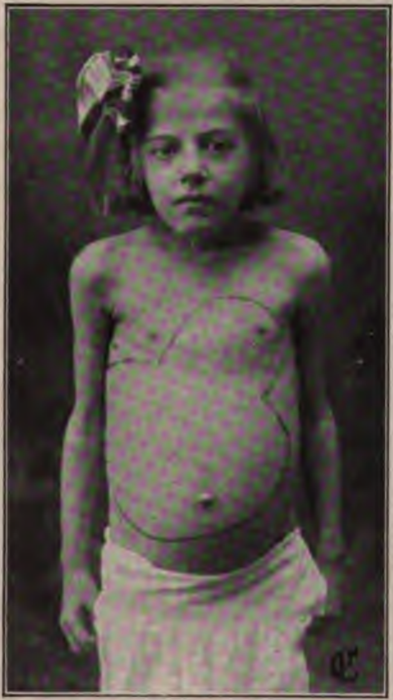

FIG. 108.—Chronic endocarditis, cardiac hypertrophy, enlargement of liver with ascites.

The extent of the heart lesion cannot be estimated by the relative loudness or softness of the murmur. We must estimate the amount of crippling caused by valvular defect by two factors in our examination of the heart: first, the position of the apex beat, and second, a marked accentuation of the pulmonic second sound. If there is no hypertrophy of any part of the heart muscle, it is not probable that any real valvular defect is present. While in early life the pulmonic second sound is relatively louder than in later years, if it is very markedly accentuated there is evidently an interference to the passage of the blood through the lungs, due to some valvular lesion.

In early years the mitral valve alone is most frequently the seat of chronic disease; next a combination of mitral and aortic lesions is found, and very rarely the aortic valve alone is affected. This is explained by the fact that the mitral valve is most often attacked by rheumatism, while atheroma, gout, and old age are the commonest causes of aortic disease.

Location of the Valves.—The mitral valve is situated at a point where the upper border of the left fourth costal cartilage joins the left border of the sternum. The aortic valves are placed behind the sternum at the junction of its left margin with the lower edge of the third left costal cartilage. The pulmonary valves are located at the junction of the left border of the sternum and the third left costal cartilage. The tricuspid valves are found behind the middle of the sternum on the level of the line connecting the fourth costosternal cartilages. The valves of the left heart are situated deeper than, and behind those of the right heart. Organic defects in the valves give rise to adventitious sounds known as organic cardiac murmurs, produced by the passage of the blood over or through the valves affected. These murmurs are not heard with maximum intensity directly over the valve affected, but near it, and are transmitted in the direction of the blood current. The following are the locations of the loudest sounds in the valves when diseased: mitral murmurs loudest at the apex; aortic murmurs loudest at second right intercostal space; tricuspid murmurs loudest at the ensiform cartilage.

Mitral Regurgitation.

Any insufficiency or leak in the mitral valves will be followed by regurgitation of blood during the systole. There will then ensue, first, a dilatation and hypertrophy of the left auricle; next, hypertrophy of the left ventricle required by the extra work thrown upon it in propelling the blood through the aortic valves, and, finally, an hypertrophy of the right ventricle which has difficulty in forcing the blood through the lungs to be emptied in the left auricle.

A physical examination will show general evidence of enlargement. A visible impulse of the heart's action can usually be detected and the apex beat is felt below and to the left, or outside its usual location. On percussion, the area of dullness will be increased to the left and below, from enlargement of the left auricle and ventricle. On auscultation a systolic murmur is heard, having a blowing and rarely a musical character. The murmur is transmitted from the apex across the axilla to the inferior angle of the left scapula. The murmur is sometimes heard in children at the latter location behind, plainer than at the apex at front. An accentuation of the pulmonic second sound is usually marked.

Mitral Obstruction.

A presystolic or auriculoventricular sound is produced by some interference with the normal and easy passage of blood through the auriculoventricular septum or valve. The murmur is rough and blubbering in quality, beginning at the end of diastole and ending abruptly with systole. One of the most characteristic points about this murmur is its abrupt termination. This quick stop of the abnormal bruit is very different from the gradual ending of mitral regurgitation. The obstruction in the valve leads to hypertrophy of the left auricle and finally to enlargement of the right ventricle, which has more work to do in flushing the blood through the lungs. The left ventricle is not hypertrophied, and accordingly the apex beat will appear in about its normal location. Any enlargement will be noted by an increased area of dullness to the right of the sternum. A purring thrill is usually felt by placing the hand over the heart. On auscultation a blubbering murmur is heard only in the region of the apex and is not transmitted. It is likewise somewhat variable and may be hardly audible during repose, and yet very evident when the patient is required to make some exertion. The pulmonic second sound is always accentuated.

Chapin has reported a series of forty cases in which children giving evidence of mitral obstruction were kept under observation for different intervals of time from a few weeks to several years. The commonest symptoms noted were varying degrees of pain referred to the region of the heart and dyspnea on exertion. Thirty-one of the cases gave evidence of simple mitral obstruction, while in nine cases there were combined murmurs. Most of the cases were preceded by a rheumatic manifestation that was mild even for children, and he concludes that while mitral stenosis is not independent of rheumatism it is apt to be associated with the less pronounced forms of it.

In growing children, especially girls, who are pale, nervous, anemic, and troubled with digestive disturbance, an irregular action of the heart may produce a rough sound simulating mitral obstruction, which disappears under improved conditions.

Aortic Obstruction.

This lesion is infrequent in childhood. It is accompanied by a systolic murmur heard at the base at the second right interspace and transmitted upward. The aortic second sound is somewhat weakened, but there is no accentuation of the pulmonic second sound. There is hypertrophy of the left ventricle and the apex beat is accordingly pushed downward and outward. The latter will distinguish this sound from functional or hemic murmurs with which it is apt to be confused.

Aortic Regurgitation.

This lesion is likewise not very frequently seen in early life. The murmur is diastolic, taking the place of the aortic second sound. It is rather harsh in character and is transmitted downward over the sternum, being heard with greatest intensity at about the fourth cartilage or sometimes at the lower extremity of the sternum. There is great hypertrophy of the left ventricle, and accordingly much displacement of the apex beat downward and outward, and the heart usually acts with considerable force. The so-called "water-hammer pulse" is typical, consisting of a full, arterial wave followed by a sudden fall in the pressure.

Tricuspid Regurgitation.

This lesion is very rare and apt to be overlooked. It may be caused by disease of the valve itself or secondary to a dilated right ventricle. There is a very soft systolic murmur heard over the ensiform cartilage. It is distinguished from aortic regurgitation by being systolic instead of diastolic, and also by more marked cyanosis, by pulmonary edema, and jugular pulsation.

Prognosis in Valvular Disease.— The immediate prognosis in children, even when the lesion is fairly severe and extensive, is usually good for reasons already noted. There is nearly always, however, a more or less defective nutrition. There are cases in which slight lesions appear to undergo complete recovery, especially when a healthy general growth can be accomplished. Repeated attacks of rheumatism, with the danger of renewed endocarditis, are a grave menace to the heart by upsetting compensation and increasing existing lesions or forming others. The ultimate prognosis is not good in most cases of marked valvular disease with any evidences of decompensation, as it is only a question of time when the compensation will fail in later life.

Treatment.— Many cases require no treatment directed to the heart, but the general nutrition and growth require careful oversight. Nourishing, digestible food, with the occasional administration of remedies to build up tissues, such as iron and cod-liver oil, are frequently all that are required. These cases should not be restricted too much in exercise and amusement. All the milder games may be allowed, only avoiding the more violent and competitive sports. Any acute infectious disease and the slightest manifestation of rheumatism must mean extra rest, and anxious care on the part of the physician. Any evidence of failing compensation will likewise require rest and the administration of heart tonics, especially strychnin and digitalis. Then Nauheim baths and graduated cardiac exercises will be required to establish convalescence. In cases of great dyspnea and restlessness small doses of codein by the mouth or minute non-narcotic doses of morphin given hypodermatically will often afford relief.

Functional Cardiac Disorders.

The heart in growing children, especially those with a neurotic tendency, is very prone to functional disorder. Digestive disturbances and the anemias are the commonest exciting causes.

Palpitation of the heart.— This is seen in connection with indigestion, from the use of improper food or from the abuse of tea, coffee, or condiments. In older children the strain from overstudy or from masturbation, especially at the time of adolescence, is a common cause. The heart may be unusually slow or rapid in action, but oftener the latter.

Hemic Murmurs.— These murmurs are not often heard in infants and very young children, but are fairly frequent in older children. They are invariably systolic and are usually heard at the base. A diastolic murmur is always organic. The hemic murmurs are heard more distinctly over the pulmonary than over the aortic interspace, are inconstant, and are not transmitted in the direction of the blood current. They are usually accompanied by a venous hum in the jugular and subclavian veins. The most reliable differentiation between hemic and organic murmurs consists in the enlargement of the heart from compensatory hypertrophy seen in the latter. Murmurs, apparently of hemic origin, are sometimes noted in acute febrile affections. Dynamic murmurs, due to a faulty action of the heart muscle, are sometimes detected after violent exercise and in choreic or hysterical children. A cardiorespiratory murmur may be produced by the impulse of the heart against some of the pulmonary vesicles at the end of a deep inspiration. It is always systolic and is not heard at the end of expiration.

Treatment.— The management of functional heart troubles is principally dietetic and hygienic. The digestion must be carefully regulated and only nourishing and easily assimilable food be allowed. It may be necessary to remove the children from school so that they can be free from nervous strain and have more opportunity to get plenty of fresh air and sunlight. All the known sources of nervousness must be removed and opportunity given for abundance of sleep. Iron and cod-liver oil are the best remedies. Small doses of Fowler's solution may also be employed.

CHAPTER XXVII.

DISEASES OF THE PERICARDIUM.

Pericarditis.

This is an inflammation of the pericardium secondary to some infectious disease.

Etiology.— The most frequent cause is rheumatic fever. It may also occur in connection with the exanthemata, especially scarlet fever, in various septic processes, in tuberculosis and pneumonia. Direct injury is rarely a cause, and it may spread by continuity from pleurisy. The following bacteria may act as exciting causes — streptococci, staphylococci, the tubercle bacillus, the colon bacillus and the pneumococcus.

Pathology.— We may recognize three varieties — the fibrinous, serofibrinous and purulent, according to the inflammatory exudate. In the first or adhesive form, the pericardium is covered by an exudation of fibroplastic matter which may lead to adhesions between the visceral and parietal surfaces. In the serofibrinous form, the pericardial sac contains a serous fluid, together with a fibrinous exudation, which produces adhesions on absorption of the fluid. The serofibrinous exudation may occasionally become purulent, and rarely blood is exuded into the sac. Miliary tubercles may infiltrate both the visceral and parietal surfaces in the tuberculous form. Permanent adhesions will be produced by the fibrinous exudation being replaced by new connective tissue. More or less myocarditis is present in connection with pericarditis, the same as in endocarditis.

Symptomatology.— The subjective symptoms are of such a negative character that the disease is often overlooked. As it is usually a secondary condition, the original disease is apt to mask the symptoms that are present and occupy all the attention of the physician. Palpitation of the heart, dyspnea, more or less pain in the epigastric region, rapid, irregular pulse, and increased respirations are usually present. In severe cases cyanosis may be marked. Where pus is present in the effusion, the temperature assumes a more remittent curve.

Physical Signs.— As the rational signs are obscure, the physical signs assume great importance in making a diagnosis. In the fibrous form, a superficial friction sound, synchronous with the beat of the heart, may be detected. It may be heard on systole alone, or with both systole and diastole. It is usually more distinct at the base, but it may also be heard toward the apex, especially at the onset of the disease, and is not transmitted.

At first, the sound may have a crepitant quality, but later assumes a coarser, rubbing, or rasping character. A friction fremitus may be felt over the region in which the friction rub is localized by auscultation.

In the serous form there may be some bulging at the precordial region, depending upon the amount of the effusion. From one to two fluidounces must be present in the pericardial sac in order to produce marked signs. The apex beat is not distinct, being pushed upward and to the left. Where there is extensive effusion, the apex beat may be lost. There will be an increased area of precordial dullness over the distended sac. It may extend on the left outside the mammary line from the seventh rib up to the first rib, and from a little to the right of the sternum down to the liver. As in pleural effusions, there will be a slight resistance to the finger on percussing. On auscultation the heart sounds are muffled or feebly heard, and the apex is located with difficulty, if at all. As the fluid is absorbed the friction rub will again be noted and the valvular sounds become more distinct.

Diagnosis.— This must be made by a careful examination of the heart in reference to the physical signs just noted. In endocarditis the apex can be located and the soft, blowing murmur is transmitted. Acute dilatation of the heart and hypertrophy will show an enlargement and increased area of dullness, but there will be no friction rub nor signs of effusion, and the previous history will help to throw light on the case. A left pleural effusion, with or without pericardial effusion, may raise a difficult point in diagnosis. The flatness from the pleural effusion will not extend over the heart and sternum if there is no pericardial effusion, but, if both are present, the extensive dullness and feeble or absent heart sounds will afford a probable diagnosis.

Prognosis.— The immediate outlook is good except in the septic and purulent forms of the disease. The heart may, however, be permanently crippled in the case of extensive adhesions.

Treatment.— The child must be kept perfectly quiet in the recumbent position as in all other forms of acute heart trouble, and milk or other bland food given. Tumultuous action may be controlled by an ice-bag over the heart. Small doses of morphin or codein may be employed to quiet and strengthen the heart's action, to control pain, and relieve restlessness. If the heart is weak and unsteady, strychnia, caffein, or alcohol may be employed. Where effusion is extensive enough to seriously embarrass the action of the heart, aspiration may be considered. We have seen a case of sudden death, however, due to a slight puncture of the heart muscle where this operation was employed. Rheumatism if present, or the original causative disease, must be treated in connection with the measures aimed at the pericarditis.

Instruments of Precision as Aids in Diagnosis of Cardiac Conditons.

There have been no startling advances in our methods of physical diagnosis since the days of Skoda and his pupils, and we are only now, through the use of scientific instruments, adding valuable record findings to those of the unaided senses.

The use of the polygraph and cardiograph have proved of great value in correlating physiologic and clinical data, and give records which are true for all time, and only require correct interpretation. These records have stimulated closer study of the heart and the circulation, so that the anatomist, physiologist, pathologist and clinician have all profited thereby and developed newer conceptions of the intricate cardiac mechanism.

With these instruments it can be shown definitely whether the cardiac rhythm is normal; if normal, whether the arrhythmia is due to respiration or other influences; whether ventricular contraction follows auricular contraction as it should; whether the excitability of the heart is normal. It is possible to study the functions of the cardiac muscle, namely, tonicity, rhythmicity, contractibility and conductivity. Thus far, the function of conductivity is best understood, and we find it disturbed in the usual forms of pulse irregularity. A study of the tracings tells whether the irregularity is due to heart block, fibrillation of the auricle, or extrasystole, and, if the latter, which one of the three varieties of extrasystole is present.

If the lesion is in the auriculoventricular bundle, and is so extensive as to cause complete "blocking" of the stimulus, then ventricular contraction does not follow that of the auricle, as it normally should, resulting in what is known as "heart-block." The dissociation between auricle and ventricle may be absolutely complete (the auricle beating independently of the ventricle and *vice versa*) or the ventricle may beat to every second, third or fourth auricular contraction.

When making a physical examination of a patient with heart disease, perhaps the least important for the patient is the determination of the precise valve involved. The examiner should endeavor to determine the exact power of the heart to respond, to study the functionating ability of the myocardium and obtain data of the cardiac activity. These facts, in conjunction with the physical findings as to size, possible dilatation, or organic lesion, enable the physician to form a much more precise opinion as to the prognosis, while his treatment, at least, is based on scientific facts and can be controlled by further observations.

SECTION IX.

DISEASES OF THE BLOOD AND DUCTLESS GLANDS.

CHAPTER XXVIII.

DISEASES OF THE BLOOD.

Glossary.

CORPUSCULAR ELEMENTS.

Erythrocytes	red cells.
Leukocytes	white cells.
Poikilocytosis	variations in shape of red cells
Normoblast	nucleated red cell of normal size.
Microblast	nucleated red cell of small size.
Megaloblast	nucleated red cell of large size.

LEUKOCYTOSIS. (or hyperleukocytosis): increase in total number of white cells (more than 12,000) usually implies a polynucleosis.
LEUKOPENIA: decrease in total number of white cells (below 6,000).
POLYNUCLEOSIS: relative and absolute increase of the polynuclears.
LYMPHOCYTOSIS: relative and absolute increase in lymphocytes.
EOSINOPHILIA: relative and absolute increase in eosinophiles.

Blood.

Blood consists of a clear yellowish fluid, the plasma, in which float the cellular elements or corpuscles, the red cells giving to blood its characteristic color; the white cells or leukocytes act as phagocytes, and the blood plates are the product of degenerating leukocytes.

Normal blood contains the following number of cells and blood-plates to the cubic millimeter.

Erythrocytes	4,500,000 to 5,000,000
Leukocytes	7,500
Plates	150,000 to 300,000

The color of blood is due to the presence of hemoglobin, an organic compound of iron. When of normal intensity, this color is given as 100 per cent. The color-index of a specimen of blood is obtained by dividing the per cent. of hemoglobin by the per cent. of red blood-cells. Normally, the color-index is $\frac{100\% \text{ Hb.}}{100\% \text{ r.b.c.}} = 1$.

The specific gravity of blood is highest in the new-born and during the first week or two falls to its lowest point. It remains low during the first two years of life, averaging 1.050 to 1.055, then gradually increases as puberty is reached. In adults the specific gravity is about 1.059. The specific gravity varies directly with the amount of hemoglobin present.

RED BLOOD-CELLS (erythrocytes) are most numerous per cubic millimeter in the first twenty-four hours of life, Hayem estimating the number to be 5,900,000. This number gradually falls during the days in which the infant loses weight. About the seventh day the average number per cubic millimeter is 4,500,000. This is the average number of cells throughout childhood. Hayem is also the authority for the statement that early ligation of the funis reduces the number of red blood-corpuscles about 500,000 per cubic millimeter.

Trifling causes in infancy and childhood result in marked changes in the red blood-corpuscles in number, size, and shape; hence poikilocytosis and anemia are common.

THE RED BLOOD-CELL is a biconcave disk, non-nucleated, varying greatly in diameter, 3.3 micromillimeters to 10.3 micromillimeters having opaque yellowish rims and nearly transparent centers. In adults they show a marked tendency to cohere by their flat surfaces forming long rows (rouleaux), though in infancy this property is much less marked.

NUCLEATED RED CELLS are not normally found in infants. In prematures they may be found for three or four days. There are three varieties of nucleated red cells: (1) Normoblast which resembles a normal red cell in all particulars except that it is nucleated; (2) Megaloblast — a large cell 10 micromillimeters to 20 micromillimeters in diameter — seen only in severe anemias; (3) Microcyte which is smaller than the ordinary red cell; this form is rare.

WHITE BLOOD-CORPUSCLES (or leukocytes) vary in size from the size of a red cell to two or three times that size. In the fresh state the larger ones present ameboid movements if kept at body temperature. In stained specimens the following forms may be recognized. (1) Polynuclears (or polymorphonuclear neutrophilic leukocytes); these constitute about two-thirds of all the white corpuscles in normal adult blood. In infancy, they occur in about 18 to 40 per cent. Stained by Wright's method, the nucleus takes on a deep navy-blue color. The nucleus is very irregular in shape, no two being alike. The protoplasm stains pink. The average size of these leukocytes is 13.5 micromillimeters.

(2) Lymphocytes, stained by Wright's method, show a small oval nucleus about the size of a red cell and stain deep blue; around the nucleus is a narrow rim of protoplasm which stains a light blue. At birth, the lymphocytes comprise about 40 to 60 per cent. of the total number of leukocytes; lymphocytes vary in size from that of a red cell to two or three times this size, and so are named large or small. In the large variety, the nucleus may be placed eccentrically or indented, and the protoplasmic rim may be much wider than in the small ones. The average size of large lymphocytes is 13 micromillimeters; of small ones 10 micromillimeters.

(3) Eosinophiles also have polymorphous nuclei of much looser structure and larger granules than the polynuclears. With Wright's method the nucleus stains a light blue or lilac and the granules a brilliant pink, the protoplasm staining a pale blue. The average size of eosinophiles is 12 micromillimeters.

(4) Mast cells are about twice the size of a red cell, *i.e.*, 15 micromillimeters. The nucleus is usually polymorphous. Large granules (staining dark blue or almost black) lie over and around the nucleus and along the margins of the cell.

(5) Myelocytes occur only in pathological conditions. These are bone-marrow cells, and are the forerunners of the polynuclear cell. It is a large cell, the average diameter being 15.75 micromillimeters; it differs from the large lymphocytes in having granules; it differs from the polynuclears only in the shape of its nucleus which is oval and not broken up and which is in close contact with the cell wall for a large portion of its extent, *i.e.*, if egg-shaped it is placed eccentrically.

According to Hayem, the number of leukocytes per cubic millimeter during the first forty-eight hours of life averages 18,000; falls to 7,000 for the third and fourth days; and averages 9,000 to 11,000 after the fifth day. The counts of Schiff, Orunsky and Rieder run considerably higher than this. The following table (by Wile) gives the relative percentage of polynuclears and lymphocytes in the blood during the first ten years:

Age in years	Polynuclear neutrophiles	Lymphocytes
1	35%	53%
2	38%	51%
3	42%	47%
4	47%	41%
5	52%	39%
6	52%	37%
7	53%	35%
8	54%	33%
9	55%	31%
10	60%	30%

Leukocytosis (or hyperleukocytosis), *i.e.*, an increase in the number of white blood-corpuscles per cubic millimeter, is present in the following pathological conditions: Pneumonia, diphtheria, pertussis, scarlet fever, erysipelas, rheumatism, acute rickets, septic and cerebrospinal meningitis, and in pus cases, such as appendicitis, peritonitis, empyema, osteomyelitis, and acute abscess. In the above conditions the increase of cells is in the polynuclears and is known as polynucleosis. Leukocytosis is also physiological; *e.g.*, in the new-born, after exercise, after a cold bath, and after a full meal; in this latter condition the count may be increased 33⅓ per cent.

Leukopenia is a state of diminished leukocyte count, and occurs in typhoid, measles, influenza, malaria, tuberculous inflammations and gastroenteritis.

Lymphocytosis is an increase in the number of lymphocytes, and occurs in syphilis (congenital), scurvy, and splenic disease.

Eosinophilia, an increase in the number of eosinophiles, occurs in leukemia, chronic skin disease, and in patients infected with intestinal parasites, particularly trichina.

Blood-plates (or plaques) are best seen in fresh-blood preparations. They are very small, round or oval bodies, about 2 to 3.5 micromillimeters in diameter. In a few seconds they lose their rounded form and become spinous, and ultimately very thin filaments of fibrin are seen starting from their angular projections. Their functions are not known.

Anemia.

A decrease in the amount of hemoglobin produces a state known as anemia. The decrease may be in the total amount of blood, in the total number of corpuscles, or in the coloring matter of the red cells. Alterations in the number of leukocytes do occur in anemic states, yet these changes cannot be regarded as factors in the process.

Simple or Secondary Anemia.

These anemias are more often secondary to some of the severe, acute, or constitutional diseases, as gastroenteritis, syphilis, rickets, tuberculosis, nephritis, pneumonia, etc. Bad hygienic conditions and unsuitable food are often responsible and occasionally fatal. The nurslings of diseased mothers are especially liable to anemia. Loss of blood from any cause is serious in early life, and the resulting anemia occasionally persists. The parasites and the toxemias produce anemias of this type.

Pathology.— The red blood-corpuscles are diminished in number, sometimes decreased to a million and a half or less. The hemoglobin is lowered to 30 per cent., but we have not too rarely had an estimation of 10 to 15 per cent. Irregular forms are seen in the severe types. Leukocytosis in our experience is more often observed than absent in early life.

Symptomatology.— Languor, anorexia, pale or blanched mucous membranes and sallowness of the skin is usually present. Constipation is the rule. The gastrointestinal tract is early disordered. Later the child tires easily and becomes dyspneic on exertion. The extremities are cold. The pulse is soft. The heart action is rapid and hemic murmurs are heard over the base and in the neck. The sleep is broken, and the temperament changes. While there is usually a steady loss of weight, augmentation may follow in aggravated cases of edema.

The spleen and liver may be found to be enlarged or enlarge after some weeks of illness. These children are prone to intercurrent affections and easily succumb to a pneumonia or gastroenteric infection.

Differential Diagnosis.— Lymphatic leukemia must be distinguished if there is splenic hypertrophy present. The more intense blood picture with its varied forms establishes the diagnosis together with the slower and more protracted course resisting ordinary treatment.

In the pseudoleukemia of infants (von Jaksch) we have a marked leukocytosis with splenic and hepatic enlargement coupled with a hypertrophy of the lymph nodes.

Prognosis.— The etiological factor and the intensity of the leukocytosis present must be taken into consideration in framing the prognosis. A low red blood-cell count, reduction of the hemoglobin to below 30 per cent., coupled with a high color-index, are unfavorable features; otherwise the prognosis is good.

Chlorosis.

This is an anemia characterized pathologically by a lowering of the hemoglobin without a marked decrease in the number of red cells and clinically by a greenish-yellow color of the skin.

Etiology.— Girls at the age of puberty, especially those who work in factories, or those who have deficiency of fresh air and sunlight, are liable to chlorosis. Boys are occasionally affected. The stress of school duties and early social life predispose in the wealthier classes.

Pathology.— Hemoglobin as low as 20 to 30 per cent. is commonly observed. The red cells themselves are somewhat below normal and the color-index is lowered. The leukocytes remain normal, unless complications are present.

Symptomatology.— A striking pale green color of the skin, with pale mucous membranes, in a well-nourished girl who complains of languor and who has a capricious appetite, are symptoms strongly pointing to chlorosis. The blood examination will confirm the diagnosis. The disease runs a chronic course, and any of the following symptoms may be noted before the disease is arrested: Shortness of breath, hemic murmurs at the base of the heart and in the large vessels in the neck. There is some edema of the finger-joints. Rapid heart action with palpitation, gastric hyperacidity, constipation, and headache are quite common. Percussion may show an enlargement of the heart to the right. The temperament changes, the patient becoming irritable, fussy, or even hysterical.

Diagnosis.— A careful examination should be made to exclude tuberculosis (see Tuberculin Tests), gastric ulcer, and the status lymphaticus. The movements should be examined for the ova of the intestinal parasites.

Prognosis.— This is good if radical changes are made in the daily life of the patient and complications can be excluded. The disease does not react as readily to iron therapy as other anemias and runs a more prolonged course.

Pernicious Anemia.

This is rare in early life. The characteristic blood changes establish the diagnosis. The red blood-corpuscles are reduced in number; megaloblasts, poikilocytosis, polychromasia, normoblasts and megaloblasts with myelocytes are found. The hemoglobin contents is considerably reduced. The color-index is high. The leukocytes are low and the lymphocytes relatively increased. The spleen, liver, and glands are not hypertrophied. As the symptoms, course, and treatment do not differ from those in adults, they have been omitted, the blood picture being presented for purposes of differential diagnosis. Blood transfusion offers the only hope of recovery.

Leukemia.

This is an uncommon disease in infancy and childhood, characterized by a great increase in the white blood-cells and changes in the spleen, bone-marrow, and lymph nodes.

Etiology.— In early life syphilis, rickets, malaria, and the chronic affections in general are regarded as the possible causative factors. Whether there is a specific infection, as has been claimed, is still unsettled.

Pathology of the Blood.— Two forms are distinguished; the myelogenous or splenomyelogenous leukemia and the less common lymphatic form. These are differentiated by their blood picture.

SPLENOMYELOGENOUS FORM.— The white blood-cells are enormously increased — 100,000 to 500,000. Among these the myelocytes are found in large numbers. The polynuclear neutrophiles are relatively increased.

There is an increase in the large mononuclears, the polynuclear and mononuclear eosinophiles. The mast cells may be found in considerable numbers.

LYMPHATIC FORM.— The lymphocytes are enormously increased, forming nearly the whole percentage of white blood-cells. Myelocytes and mast cells are sometimes found. In both forms there is a diminution in the amount of hemoglobin and in the number of red blood-cells with the presence of a few normoblasts.

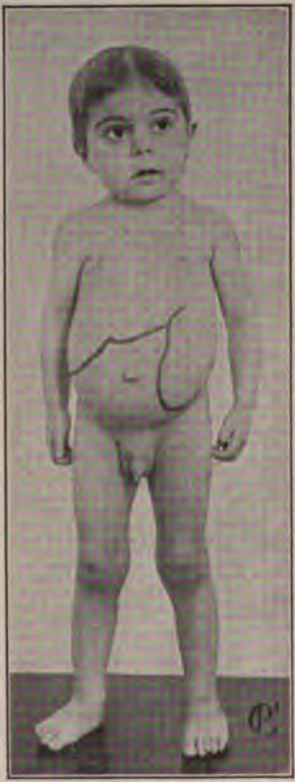

FIG. 109.— Leukemia; markings show enlargement of liver and spleen.

Symptomatology.— The onset may be acute, but a slow insidious onset is the rule. The pallor of the skin and mucous membranes with digestive disturbance may be the first symptoms noticed, or a sudden hemorrhage from the nose or blood in the stools may first attract attention. Vomiting and diarrhea become more and more frequent. Falls easily cause ecchymotic areas. The abdomen is tympanitic and protuberant, and in one of our cases this was the first symptom to attract the mother's attention. The spleen is found enlarged and may touch the crest of the ilium. It may be tender on palpation.

The lymph nodes are quite generally involved, especially the cervical group. On rectal examination the mesenteric nodes are found palpable. Even the lymphoid structures in the naso pharynx are hypertrophied. The liver is found enlarged and assists in making more striking the general abdominal enlargement. As the disease advances, dyspnea, rapid heart action, and obstinate constipation are in evidence. The child becomes somnolent, refuses food, and dies of exhaustion.

Prognosis.— It is a fatal disease in the pure types.

Pseudoleukemia of Infants.

(von Jaksch's Anemia.)

There has been and still is much diversity of opinion with regard to the disease having a distinct entity. We have had cases that conformed quite closely to von Jaksch's description and which seemed to develop from a long-continued severe anemia. The disease is characterized by a grave anemia with leukocytosis, enlargement of the spleen, liver, and lymph nodes.

Etiology.— Infants who have had secondary anemias or who have rickets and syphilis are predisposed.

Pathology. Blood.— The red blood-corpuscles are diminished to as low as two millions. Microcytes, megalocytes, and poikilocytes are found. Nucleated red cells, normoblasts, and megaloblasts may be found.

The white blood-cells are proportionately increased up to 50,000 or more. The differential count shows an increase in the mononuclears and polynuclears. The eosinophiles may also be increased. Myelocytes are seen, but are few in number.

Symptomatoloy.— The infant is extremely pale, sallow, or cachectic. Slow but progressive emaciation is the rule. The infant shows little or no interest in its surroundings. The appetite is small and intestinal indigestion is frequent. The cervical lymph nodes are palpable and the liver and especially the spleen are enlarged. The spleen is easily palpable, feels hard, and it is not painful. The infant mav die of exhaustion or a complicating bronchopneumonia.

Differential Diagnosis.— From leukemia it is sometimes with difficulty differentiated, but the lower leukocyte count, the scarcity of myelocytes, the less pronounced hepatic and lymph node hypertrophy will aid in classifying the disease.

Prognosis.— This must be regarded as a grave blood disorder.

The principal anemias are tabulated in the following chart with the blood conditions briefly enumerated:

TABLE OF ANEMIAS.

	Chlorosis	Pseudoleukemia (von Jaksch) Splenic anemia	Leukemia, Splenomedullary	Leukemia, Lymphatic	Pernicious anemia
Red blood-cells, number.	Usually diminished, rarely under 2 million.	Greatly reduced. Below 3 million.	Moderately diminished.	Diminished to ½ normal.	Generally greatly reduced, about 2 million.
Size and color, red blood-cells.	Diminished in size. Microcytes frequent. Paler in color.	Unequal in size....	Variable	Variable	Increased in size. Megalocytes frequent, color usually not diminished.
Shape, red blood-cells.	Poikilocytosis seldom excessive.	All degrees of poikilocytosis.	Poikilocytosis present, but variable in degree.		Poikilocytosis always extremely pronounced.
Hemoglobin	Relatively greater diminution than number of corpuscles.	Marked diminution, as low as 30%.	Diminished proportionately to or greater than the corpuscles.		Generally 20–40%, relatively higher in excess of corpuscles.
Color Index	Always low		Generally normal, sometimes lower.		Frequently high.
Normoblasts	Present in severe cases generally in small numbers.	Numerous, and show karyokinesis.	More numerous in all degrees than in any other disease.	Rare, usually absent.	Almost always present.
Megaloblasts	Absent or extremely rare	Sometimes found, especially if severe.	Rare	Absent	**Nearly always present and more numerous than normoblasts.**

TABLE OF ANEMIAS — CONTINUED.

	Chlorosis	Pseudoleukemia (von Jaksch) Splenic anemia	Leukemia Splenomedullary	Leukemia, Lymphatic	Pernicious anemia
Leukocytes, number.	Generally normal ..	Increased 40,000 to 115,000 c.m.	Enormously increased.	Enormously increased, but not so much as in splenomedullary type.	Usually diminished.
Lymphocytes	Sometimes relatively increased.	Sometimes increased.	Relatively diminished.	Enormously increased.	Usually relatively increased.
Polynuclears	Usually normal, sometimes diminished.	Usually increased.	Relatively diminished		Usually diminished.
Myelocytes	Absent or extremely rare.	Occasionally found.	Very numerous, often 50%, characteristic.	Usually absent	A very large percentage frequently present.
Spleen and lymph glands.	Not usually enlarged.	Marked enlargement. Slight enlargement.	Greatly enlarged.	Greatly enlarged...	Not usually enlarged.
Age	12 years to 18 years.	7th to 12th month.			Any age.
Onset and course.	Insidious	Insidious. Progressive weakness.	Rapid	Rapid	Insidious.

Treatment of the Anemias.

The general management of these cases is of greater importance than the administration of drugs. The causes which have produced the anemia may or may not be clear, but the majority of cases are in all events benefited by a regulation of their daily life. If the causative agent, as parasites, is found, treatment should be directed toward its removal. Sunshine and fresh air coupled with an easily assimilated diet as rich in proteids and organic iron as possible, should be considered as necessities for all the anemias.

Aerotheraphy may be limited by the circumstances as in the case of the poor city child, but five hours a day in the open air can always be obtained even in the winter months by using the child's room, the roof, or the parks.

The children are more benefited when removed to the country. If the child has been attending school, this should be discontinued and the amount of exercise curtailed. Rest in bed is necessary for the severe cases, but this should not preclude sun baths and fresh-air treatment. If possible the child should be cared for and entertained by one person so as to avoid undue excitement or fatigue.

A bottle-fed infant should gain in weight and strength if the formula is suitable to its requirements. If assimilation is at fault a wet-nurse may be required, or such changes and additions should be made to the food as will at least temporarily promote the digestive capacity. (See article on Infant Feeding.)

Older children should have an individual diet list prepared for them which will contain especially such articles as fresh raw milk, eggs, green vegetables, rare meats, and fresh fruits. (See Diet Lists, p. 162.) Spinach, yolk of egg, and the legumes contain organic iron in largest quantities, and it is desirable that the deficiency in iron should be made up from the natural foods rather than iron preparations.

Drugs.— In chlorosis the iron preparations are of distinct value, especially when given with a nutritious diet and baths. Many of the anemias are benefited by the scale preparations, especially the citrate of iron and ammonia and the bitter wine of iron. Several trials may be required to find the preparation of iron best suited to the individual case. The various peptonates often do well, as they are easily tolerated by the stomach, but other cases will apparently do better on the old tincture of the chlorid of iron, well diluted and given through a tube. In older children, Blaud's pill will often do good service. Fowler's solution should be given in addition to the leukemias and in pernicious anemia, beginning with one drop three times a day well diluted and gradually increasing to the physiological result, care being taken not to produce symptoms of arsenical neuritis. Cod-liver oil is a valuable addition if it is well borne and does not produce an aversion to the ordinary diet.

We have used the *X*-rays in selected cases of splenic leukemia, but the results which at first seemed promising do not warrant its general use.

Several of our severe secondary anemias not due to any recognized underlying cause, which have resisted all other forms of treatment, have been cured by transfusion of whole blood by the syringe-canula method. Once assisted the organism apparently is enabled to make new blood, for we have noted no relapses in this type.

Purpura.

In this condition subcutaneous hemorrhages, petechial or ecchymotic in type, appear spontaneously and form one of the symptoms of a disease. Different names have been applied varying with the location and extent of the hemorrhages.

It is known as purpura simplex when the hemorrhages occur into the skin only, and purpura hemorrhagica when bleeding takes place into the mucous membranes or internal organs.

Etiology.— Any infectious process at any time during its course may be accompanied with purpura. It especially occurs in children with scarlet fever, variola, measles, cerebrospinal meningitis, and with septic processes in any organ.

Pathology.— Hemorrhagic exudates may be found varying with the type of the disease either in the skin, mucous membranes, or internal organs, or in all of these situations. The spleen is enlarged in those types occurring with marked infection. The study of the blood has thus far thrown no light on the pathology of the disease. Further study of the adrenal bodies, which sometimes show large hemorrhages, may explain the etiology of the disease and prove whether it is an infectious process, a pathological change in the arteries themselves, or whether it is due to vasomotor changes that allow the hemorrhage to take place.

Purpura Simplex.— The purpura may appear suddenly in a child that is apparently well, but as a rule it is preceded by prodromal symptoms resembling those of intestinal disturbance. There may be lassitude, loss of appetite, even nausea or vomiting. The stools may be slimy from improper digestion, and a low grade of fever is present in older children, but little or no variation is noted in infancy. The tibial surfaces are usually first involved, the hemorrhagic areas varying greatly in extent in different subjects. The color soon changes from a purplish-red to a dark, mottled, bluish-black. There is no pruritus nor pain on pressure over these areas. Indefinite muscle or joint pains are complained of, but localized with difficulty.

In cachectic or marasmus infants it is not uncommon to see these hemorrhagic areas appear over the abdomen or extremities. In any long-standing or exhausting disease in the early months of life, purpura may appear and must be regarded as of serious import.

In older children, however, purpura simplex tends to recovery, although relapses sometimes occur when the outlook seems most bright.

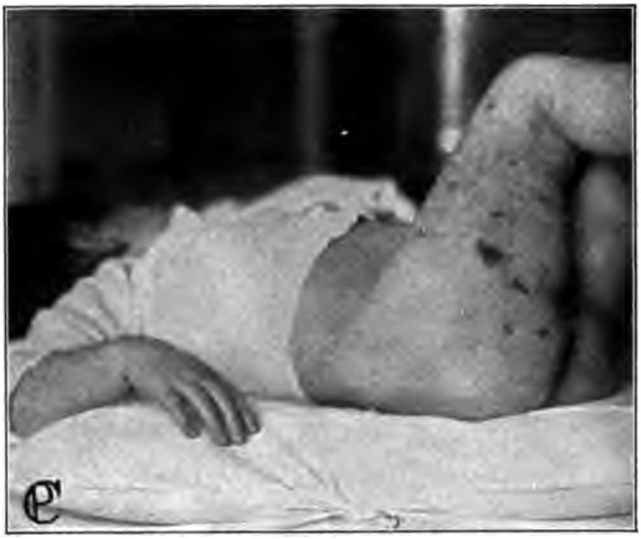

FIG. 110.— Purpura hemorrhagica.

Purpura Hemorrhagica.— In contrast to the simple form, this is a much more serious condition with a rather severe train of symptoms. After a few days of indisposition, with nausea and vomiting, fever appears, ranging from 100° to 104° F., with prostration out of proportion to the symptoms. At the same time that the hemorrhages appear in the skin, there may be bleeding from the nose or mouth. Hemorrhages in the alimentary tract may occur and are noted by finding blood in the vomitus or in the stools. The fact must not be forgotten, however, that the blood may be swallowed and later appear in the vomitus or stools. Blood in the urine usually occurs in the beginning, but ceases when the child is put at rest. Localized areas of edema may be present and, as a rule, correspond to, although greater than, the hemorrhagic areas. Pain referred to the gastric region, headache, and anorexia are quite common symptoms which persist in spite of treatment. Sleep is broken, and delirium, especially at night, may occur. Coma resembling that of the typhoidal state occurs in the severe cases and may persist until a fatal issue takes place.

Henoch's Purpura.— This symptom-complex, occurring as a rule in childhood, was first described by Henoch. The symptoms referable to the skin consist of a purpura of varying degree, often accompanied by an exudative erythema and urticaria or a localized edema. Besides the above manifestations, there are lesions in one or more joints which resemble rheumatic fever. Colicky pains, with vomiting and diarrhea, are nearly always present, but as a rule are not of long duration. As in purpura hemorrhagica, there may be hematuria or hematemesis. Albumin is generally found in the urine. Recurrences are frequent and succeeding attacks may show wide variations in the symptoms.

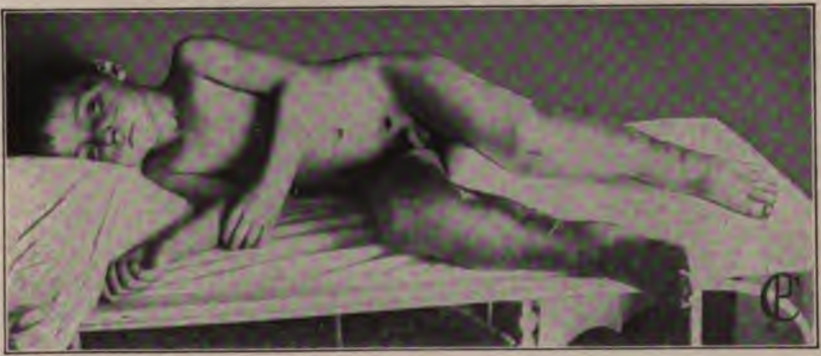

FIG. 111.— Purpura hemorrhagica,— fulminant type.

Schönleins Purpura. (*Purpura Rheumatica.*)— This form is characterized by a polyarthritis with the symptoms of rheumatic fever and purpuric hemorrhages. Circumscribed edema may be present. A variable amount of temperature occurs with the arthritis. Albumin is generally found in the urine.

Purpura Fulminans.— A very rare but fatal form of purpura is designated as a fulminant type. The onset is sudden, occurring with high fever, convulsions or chills, vomiting, and marked prostration. The purpuric eruption rapidly spreads over the whole body. The urine is scant and contains albumin. It most frequently occurs in children under five years of age, and what was formerly known as malignant or black scarlet fever and measles probably belong to this type. Hemorrhages into the adrenals have been recorded.

Diagnosis.— The diagnosis of purpura is usually easily made from the hemorrhagic nature of the lesions which do not disappear upon pressure. It is to be distinguished from infantile scurvy in which there are present swollen, spongy, bleeding gums, and articular pain combined with a long history of cooked food.

Prognosis.— In certain forms, as the simple and rheumatic, the prognosis is favorable, although it may persist for several weeks. Hemorrhagic purpura and Henoch's purpura have sometimes been attended with fatal results. The fulminant type is always dangerous to life.

Treatment.— This must necessarily be directed to the underlying cause when this is known. Rest in bed with a carefully regulated diet, including raw fruit juices, is indicated. Five minims of a 1/1000 adrenalin solution hypodermatically may be given if the hemorrhages are profuse. In convalescence the tincture of the chlorid of iron is important. Transfusion of blood should be tried in severe cases.

Hemophilia.

Hemophilia is an hereditary blood disorder characterized by a tendency to inordinate bleeding from the vessels following a trauma, or spontaneously from the capillaries into the tissues.

It is almost invariably transmitted through the mother, who herself may not have been a bleeder. The male offspring (the first born often escaping) is affected in the proportion of eleven to one of the female. The male may again transmit the disease through his daughter.

No characteristic blood changes or histological peculiarity of the vessels has been found. Coagulation is always retarded. The hemorrhages occur most frequently from the nose, mouth, genital organs, and lungs. Some trauma to these parts may be the first notice of the diathesis or the fact that slight, almost imperceptible blows produce subcuticular hemorrhages. Following a fall there may be internal hemorrhages or bleeding into a joint that may produce disability or subsequent anchylosis. Death has occurred from uncontrollable hemorrhage following circumcision or the extraction of a tooth.

Treatment.— Marriages in the families of bleeders should be controlled or at least due warning of consequences given.

Subcuticular hemorrhages are sometimes controlled by absolute rest, with ice applications and compression. Adrenalin 1/1000, or 1/500 adrin solution, may be directly applied. Stypticin in doses of gr. $\frac{1}{8}$ offers some hope of control. The gelatin solutions for subcutaneous use are to be deprecated, as they may be carriers of tetanus infection. Warm or rather tropical climates are the safest for the hemophiliac. Serial injections of whole blood — 30 c.c. once every week for six injections — has been of decided benefit in bleeders with recurrent frequent hemorrhages from the nose.

CHAPTER XXIX.

DISEASES OF THE DUCTLESS GLANDS.

The Thymus.

This small, ductless gland, of epithelial origin, consists of two lobes coming in contact in the median line. It is located during its greatest development partly in the lower part of the neck and partly on the anterior mediastinum, extending from the lower edge of the thyroid above to the fourth costochondral articulation below. It is thus in relation with the trachea above and the great vessels and pericardium below. It is largest during the first two years of life and then atrophies, but occasionally it persists longer and may last until puberty. In the course of atrophy it disappears from the neck and remains behind the manubrium. Various authorities disagree as to its normal weight. From 14 to 20 grams are said to be the average weight during infancy, but Boviard finds it much smaller than usually stated. From 100 observations made on the normal size of the thymus in early life, he found it averaged not over 3 grams, in weight. The histological structure of the thymus is similar to that of lymph-glands, and it probably functionates as a blood-forming organ.

Enlargement of the Thymus.

Hypertrophy of the thymus may produce grave effects apparently from pressure. Two possible explanations may be offered — first, that the enlarged thymus pushes on the trachea and thus embarrasses breathing; second, that dyspnea may be caused by pressure on the phrenics or pneumogastrics. It is, however, difficult to prove the latter. Laryngismus stridulous and various forms of dyspnea, sometimes called "thymic asthma," have been referred to the enlarged thymus. The symptoms may eventuate in sudden death.

The diagnosis of enlarged thymus by physical signs is rarely made positively during life. It may occasionally be palpated by deep pressure over the top of the sternum and there may be dullness on percussion behind the upper part of the manubrium extending down from both lateral borders of the sternum. The area of dullness on the sides of the sternum may be unsymmetrical.

Status Lymphaticus.

By this condition is understood a lowered vitality seen in connection with enlarged thymus and a general hyperplasia of the lymphoid tissue of the body. Sudden death from cardiac paralysis and asphyxia may ensue under anesthesia or from any intercurrent disease or irritation. Enlargement may be noted of the superficial and deep lymph nodes of the neck, of the follicles at the root of the tongue, of the tonsils, of the adenoid tissue at the vault of the pharynx, and, on autopsy, of the lymphoid structures of

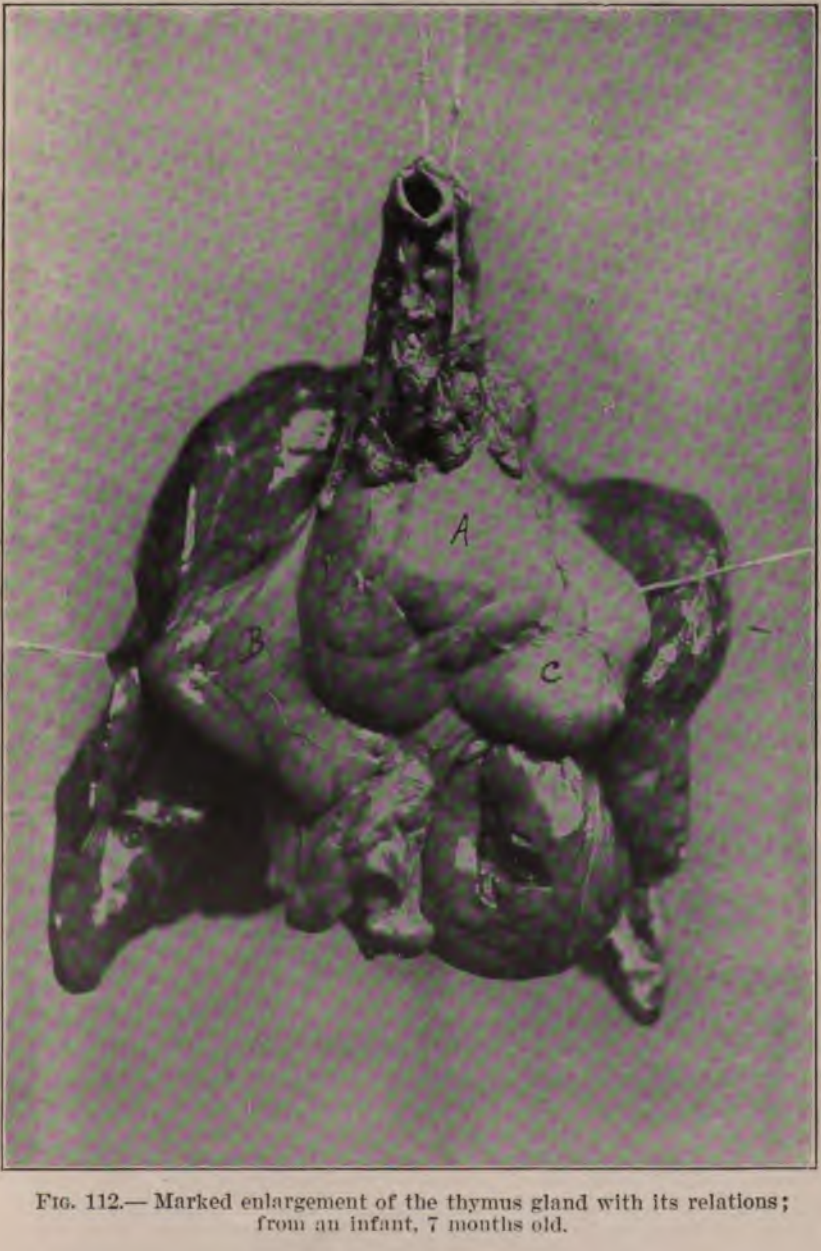

FIG. 112.— Marked enlargement of the thymus gland with its relations; from an infant, 7 months old.

the stomach and bowels. There may be some enlargement of the spleen, with hypertrophy of the Malpighian bodies. There may likewise be a proliferation of the lymphoid tissue of the bone-marrow. Drs. Musser and Ullom report the pathological findings to be practically constant in eighteen cases of status lymphaticus collated from the literature of the subject, consisting of an enlarged thymus, spleen, lymph glands, Peyer's patches, tonsils and pharyngeal tissue. While these conditions were not reported in every case, the enlarged thymus, spleen, and some of the lymph-glands were constantly found. Cloudy swelling of the liver and kidney were also fairly constant lesions. German pathologists, especially Virchow, have noted a lack of development of the heart and arteries. Thus the heart may be small and the aorta narrow and thin-walled. With this may be associated a lack of development of the sexual organs, sometimes reaching the condition of infantilism. Varying grades of rickets, with resulting mild

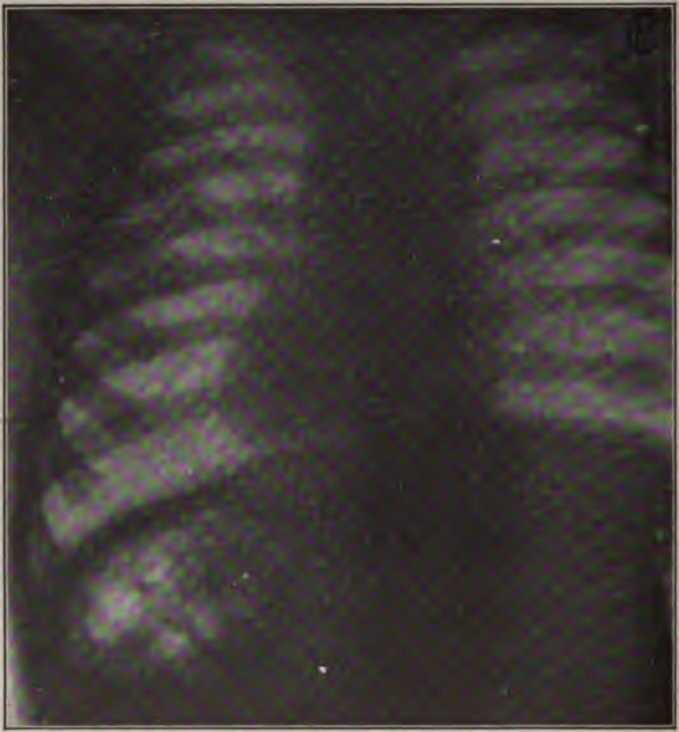

FIG. 113.—Radiograph showing enlarged thymus in a 14 mos. old child.

or severe bony deformities, are seen in a large number of cases of status lymphaticus. These children may show a fair amount of fatty tissue, but are usually anemic. Chlorosis or hemophilia may also exist.

It is very probable that the disastrous results so often seen in status lymphaticus are due to an autointoxication from a sort of lymphotoxemia having its source in the lymphatic tissues of the body. The importance of recognizing the condition is very great not only in respect to anesthesia, but for guarding the prognosis in any intercurrent mild or severe disease, and as an explanation of certain cases of sudden death without any known cause.

The diagnosis often cannot positively be made, but children or young adults with bony evidences of rickets, with much enlarged tonsils and adenoids, with generally hypertrophied lymph-glands, with the male genital organs or breasts undeveloped in the older subjects, together with an absence of pubic hair, should be considered as possible subjects of status lymphaticus.

In young subjects, attacks of laryngospasm, in conjunction with a number of these stigmata, will greatly strengthen the diagnosis. Congenital underdevelopment of the heart and arteries is usually accompanied by smallness of the surface arteries and a small pulse.

The treatment consists in careful hygienic oversight, especially as regards food, fresh air, and warm clothing. Cod-liver oil and the syrup of the iodid of iron may be given. The hypertrophied tonsils and adenoids must be early removed, but without the administration of an anesthetic.

Diseases of the Spleen.

The spleen is not uncommonly found to be enlarged in infants and children. Its elastic, distensible structure makes it peculiarly susceptible to enlargement, especially from congestion, infectious, blood, or constitutional disorders.

Its upper border lies on a line with the ninth rib, its lower border reaching to the eleventh rib. It is a safe rule to say the spleen is not enlarged if it cannot be palpated below the ribs. The position for palpation should be that described on page 42 (see Fig. 15).

Inflammation of the Spleen.

This occurs, as a rule, from a neighboring process or from trauma. Perisplenitis may occur in syphilis, tuberculosis, peritonitis, and injuries. Older children may refer their pain accurately to the splenic region. In some cases a friction rub is distinctly felt. With the stethoscope a coarse friction sound, not unlike that in pleurisy, can be heard.

Chronic Passive Congestion of the Spleen.

This is seen in connection with enlargement of the liver, tuberculosis, and in cardiac affections.

OTHER ENLARGEMENTS OF THE SPLEEN.— Sarcoma, although rare, has been observed as a primary condition. The tuberculous and syphilitic enlargements are nodular and irregular. Primary splenomegaly is accompanied by enlargement of the liver and anemia. Hydatid cysts and abscesses have been reported, but are extremely rare.

Disorders of the Adrenals.

Reports of sudden deaths from hemorrhages into the adrenals have increased the importance of these structures in early life. In infants they are relatively larger, and destruction of their function, whatever it may be, is attended with serious results.

HEMORRHAGE INTO THE ADRENAL.— The symptoms come on suddenly not unlike an acute infection. There may be vomiting and diarrhea with acute abdominal pain and, in some instances, a purpuric rash. The pulse is weak, the pallor is marked, and coma or convulsions may usher in the rapidly fatal endings.

Addison's Disease.

This is extremely rare in early life and is accompanied by the same symptoms: that is, slow progressive cachexia and bronzing of the skin as in adults. In nearly all cases tuberculosis of the adrenals is found on postmortem examination.

The course is slow, sometimes extending over years, and the prognosis invariably bad.

Treatment.— Restriction of muscular exercise and the general treatment suitable for the tuberculous is indicated; the feeding of adrenal products, as the desiccated extract or glycerinated extract, may be employed or adrenalin in solution hypodermatically may be given.

Hodgkin's Disease.

(*Adenic; Lymphadenoma; Pseudoleukemia.*)

This disease very rarely occurs in children. The main features are painless, progressive, glandular enlargement, usually beginning in the cervical region, and without the blood changes of leukemia; enlargement of the spleen and liver and a pronounced anemia; as a terminal condition tuberculosis or sarcoma may be associated, but in all probability neither of these conditions bears any relation to Hodgkin's disease.

Symptomatology.— The enlargements generally first appear in the neck. The glands slowly but steadily enlarge. They are not painful to the touch. The axillary and inguinal regions are later involved. When the general health begins to be affected it will be found that both the superficial and deep glands are affected. From their position the nodes may produce various pressure symptoms, such as dyspnea or dysphagia. In the later stages pronounced cachexia develops with an irregular or remittent type of fever. The glands never tend to suppuration, although they may fuse and form large tumors.

Differential Diagnosis.— It is distinguished from chronic adenitis by the history, the localization, and absence of cachexia. Tuberculin or the various tuberculin tests would be required to distinguish it in the absence of suppuration. Excision of a lymph node for histological examination is the safest course for absolute diagnosis.

Treatment.— Thus far this has been quite unsatisfactory. Unless the diagnosis is made when only a few glands are involved surgical removal is not advisable.

The Roentgen rays have given some good results, but this should only be used by those accustomed to the work. Arsenic may be given in large doses in the form of Fowler's solution. Out-door life at the seashore is to be preferred.

Acute Adenitis.

This is an acute inflammation of the lymph-glands producing hypertrophy of their structure.

Clinically the lymphatic glands are of great importance, their function being to guard the circulatory system, since they are obliged to take up, destroy, neutralize, or at least hold in abeyance the numberless bacteria which block their channels, and it is only when overwhelmed and overpowered by these germs that they themselves become affected.

Recent investigations along these lines have sufficiently proved that inflammation of the lymphatic glands is due to absorption, from a more or less distant focus, of bacteria or their toxins.

Accepting the crude classification of inflamed glands into acute and chronic, we find that the glands most frequently affected are the cervical, mesenteric, axillary, inguinal, bronchial, and mediastinal.

The majority of children with enlarged glands have cervical adenitis. This is accounted for by the delicate epithelium of the skin of the face and neck and the mucous membrane of the mouth and the pharynx. These being largely exposed to irritations, to bacteria, and to traumatism, we find the glands easily overpowered. It is always necessary to seek the cause or focus of the trouble and, if possible, to remove it.

Remembering that the superficial glands drain the side of the head and neck, face and external ear, and that the deeper glands drain the mouth, tonsils, palate, pharynx, and larynx, we have a clue to the initial trouble. It is not to be forgotten that the primary focus may have cleared up or may have been apparently cured and forgotten, but still the glands remain enlarged. A careful history of the eruptive and infectious diseases must be obtained; any irritations of the scalp, diseases of the ear, eyes, nose, throat, gums, or teeth must be taken into consideration. The importance of working backward from the effect to the cause in these cases must be kept in mind. Either the superficial or deep nodes may be affected. Under two years of age the external glands are affected in the majority of cases, and they also have a greater tendency to undergo suppuration. When the latter is about to take place the gland becomes painful and tender and the overlying skin is reddened. Restlessness and some degree of temperature is observed. As a rule, this takes place during the second week or it may be held in check by cold applications and result later. A spontaneous discharge of pus does not occur until the entire gland has been disintegrated. Occasionally there seems to be no apparent cause except anemia and debility for the glandular hypertrophy, but here we have a valuable clue to the treatment.

The glands may at first show no acute inflammatory changes; they grow steadily and surely, and do not easily break down. Because of the slow growth and painless tumor, and with no local cause observable, we are justified in presuming the glands to be tuberculous. The tuberculin test (page 56) should be made. Such a condition by no means signifies that the child has pulmonary tuberculosis, although having once given entrance to these germs, the possibility of an extension is present. The cervical glands may infect the thoracic chain and thus infect the lungs.

Chronic Adenitis.

This may occur as a result of frequent attacks of acute adenitis or from persistent local lesions in the neighboring structures. It is also observed in children who are the subjects of status lymphaticus. The glands must be differentiated from tuberculous lymph nodes or those seen in Hodgkin's disease.

Thoracic adenitis is in greater part of the chronic type and very often the glands are tuberculous. Loomis examined and found the tubercle bacillus in apparently normal glands. We may safely say that in a large proportion of tuberculous cases in children it would appear that the primary infection was in these structures, and that, contrary to Parrot's law, clinical experience shows that the glands may be involved without local lesions in the lungs.

In a large number of autopsies in children we have found the mediastinal and bronchial lymph-glands enlarged, sometimes pressing on the great vessels or against the bronchial tubes. In one case perforation of the cheesy bronchial gland into the adjacent lung was the cause of death. We cannot describe any definite symptoms invariably produced by these pathological glands, but occasionally we do get a persistent irritative cough caused by pressure on a bronchus or on the recurrent laryngeal nerve, or localized feeble breathing with sibilant râles due to compression of a bronchus. Percussion is unreliable, for the dullness may be due to the thymus. Recurrent attacks of bronchitis may, however, often be traced to hypertrophied lymph nodes in the thorax.

The enlarged mesenteric and retroperitoneal glands of the abdominal cavity may alone give sufficient evidence of the old-fashioned tabes mesenterica. The point of entrance of the offending germs in these cases is through the mucous membrane of the intestinal canal. If we find a general enlargement of the glands all over the body — a condition which Legrouz called microadenopathy, we have a valuable hint in doubtful cases of general tuberculous infection. On the other hand, the absence of hypertrophied lymph-glands and the enlargement of the liver and spleen is an important negative sign in chronic diffuse tuberculosis, provided we can rule out syphilis by the history of skin rashes, fissures, and the therapeutic test; for here also we may have enlargement of the superficial glands. The glands, therefore, may assist in establishing a correct diagnosis; they may point out by their anatomical distribution the source of their own infection, or they may themselves be productive of pathological conditions in adjacent viscera.

Treatment. (*Acute.*) — As has been above pointed out, the removal of the local focus of irritation is most important. If seen early the application of the ice bag or cold compresses of 50 per cent. magnesium sulphate solution may cause a subsidence of the process. The application of a 5 to 10 per cent. ointment of ichthyol is also effective. If suppuration has begun the local application of heat will hasten the process. Incision and drainage are then indicated. Dietetic and hygienic measures are important.

(*Chronic.*) — Any underlying cause, as a chronic eczema, adenoids, and hypertrophied tonsils, or a sinus, must be removed before treatment can be effective.

The syrup of the iodid of iron must be given for a long period. The *X*-ray treatment has given some good results. Tuberculous nodes should not be removed unless the extirpation can be clean and thorough.

Exophthalmic Goiter.

(*Grave's Disease; Basedow's Disease.*)

This condition, which is rare in early life, is due to an increase in the growth and activity of the thyroid gland. Our cases have occurred at or about the time of puberty, especially in girls of the neurotic type. Hyperemic goiters occurring at the time of puberty must be distinguished from true Basedow's disease. Tachycardia is present in both conditions, but the exophthalmos, tremors and purposeless movements are not present. This variety often disappears suddenly when menstruation is well established.

Symptomatology.— With the gradual enlargement of the lobes of the thyroid there may be noted symptoms resembling chorea. Nausea and vomiting at the sight of food may be the first symptom to call attention to the true condition. The child is apt to be irritable, easily excited and depressed if left without companionship.

Physical examination will show a well-marked tachycardia, usually with a soft systolic murmur at the base. The eye later has a peculiar fixed, staring look, and is covered by the upper lid with difficulty.

Graefe's sign, or the difficulty of raising the upper eyelids when the child is asked to look upward, is usually observed. Profuse diarrhea which is controlled with difficulty is rather frequent in early life. The sleep is disturbed, and several times during the day the face may become flushed and perspiration appears on the body.

Course and Prognosis.— Rarely the course is very rapid and ends fatally in a few weeks. In the majority of cases the prognosis is slow, with steady emaciation and periods of remission. The younger the patient the better the prognosis.

Treatment.—Rest in bed, both physical and mental, with a light milk and vegetable diet is required until the symptoms subside. The extremely rapid pulse may require cardiac sedatives. Ice-cold applications or alcohol compresses may answer. If not sufficient in effect, the tincture of strophanthus or digitalis may be required. The serum of Rogers and Beebe, of the Cornell laboratory, has proven of value in selected cases. The amount injected varies with the degree of toxicity and the duration of the disease. Galvanization with a mild current of three milliampères may be used with advantage in conjunction with any form of treatment. Thyroidectin, beginning with 5 drops, three times a day, a product derived from the blood of a thyroidectomized sheep, is sometimes of distinct value; it may be tried and continued if the pulse and nervous symptoms subside.

Achondroplasia.

Achondroplasia (fetal chondrodytrophy) is a rare affection in which there is a marked disproportion between the head and trunk and extremities. This is due to an abnormal process of endochondral ossification at the junction of the epiphysis and diaphysis. The principal change is a defective formation of rows of cartilage cells in the columnar zone. There often occurs an overgrowth of periosteum in this region, this tissue wedging its way in between the epiphysis and diaphysis from the periphery toward the axis of the bone. These processes both prevent growth in length of the bone.

Achrondroplasia is a congenital condition, and the features are evident at birth; sometimes the parents are undersized or dwarfed.

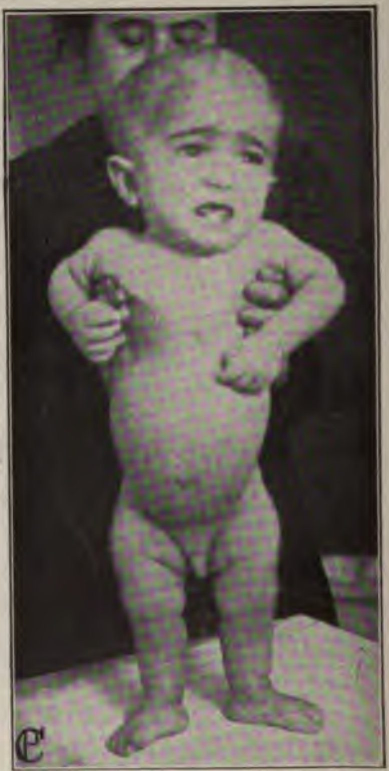

FIG. 114.—Achondroplasic infant.

The extremities are mostly affected, leaving the head and trunk nearly normal; the length of the arms and the legs is greatly diminished, the hands often reaching only to the trochanters, while normally they should reach to the knees. There is a redundancy of tissues around the thighs, making thick folds in the skin. Muscular tone is low and the joints are lax, consequently all these children are late in walking. The head is relatively large, the bridge of the nose is usually depressed, the tip of the nose is bulbous, the eyes are far apart and in the infant the tongue may be thick, this being due to a real hyperplasia. As a rule, the fontanels are late in closing; teething also is delayed.

The bones are short and thick with enlarged epiphyses; curvature in the shaft of the long bones, which often occurs, is not due to softening, but to periosteal intrusion, which offers resistance to growth in length of the diaphyses. Frequently a marked lumbar lordosis is present, the sacrum being tilted upward and backward. Beading of the ribs, as in rickets, may be present.

The hands are small and square, the fingers being short and nearly equal in length and blunted at the ends. The " trident deformity " (divergence of middle and index-fingers from ring and little fingers) is often noted. The mentality in these children is not affected to any marked degree, although they are inclined to be backward.

Prognosis as to life is good, but such children are always undersized. Organic extracts from the thyroid and pituitary glands are used in the treatment, although the results have not been satisfactory and are not to be compared in any sense to those obtained with cretins. For the differential diagnosis see the article on Cretinism, p. 408.

Infantilism.

This is a condition characterized by a retardation of bodily development out of all proportion to the chronological age.

These children are always small in stature, underweight, undeveloped sexually, and retain the falsetto voice of childhood. Their mentality, however, is usually fair and they are capable of making good progress when placed in school.

Two types have been distinguished. In the Brissaud type the children are somewhat cretinoid in appearance, the face being flat and chubby, the body plump, the hair sparse and fine on the head, and there is an absence of pubic hair. In this type, ossification and epiphyseal growth may be delayed. The juvenile state of the body and mind is long retained.

The second, or Lorain type, is distinguished by the rather slender body and finer features, although the genitals and voice remain long undeveloped. The mentality is apparently unimpaired in this latter type. Herter has recently pointed out that in cases of infantilism an intestinal digestive disorder may be the etiological factor. He believes the Bacillus infantilis to have a direct relation to the disease.

The intestinal bacteria are replaced by gram-positive bacilli. The maldevelopment is attributed to the loss of fat in the stools and the intolerance to carbohydrates.

The cretinoid type reacts favorably for a short time to the use of thyroid extract. The Lorain type is not affected by this drug, and we are inclined to favor Herter's suggestion to treat the disease as a nutritional disturbance. Gelatin is recommended as of value. The diagnosis, however, would need to be made very early in order to obtain good results.

Cretinism.

(*Myxedema.*)

Myxedema is a disorder of metabolism, resulting from an alteration or absence of the thyroid body or its functions.

Cretinism.— Two varieties are recognized: The endemic and sporadic (infantile myxedema). It is with sporadic cretinism that we are concerned in this country. The symptoms are the result of the complete absence of the thyroid gland.

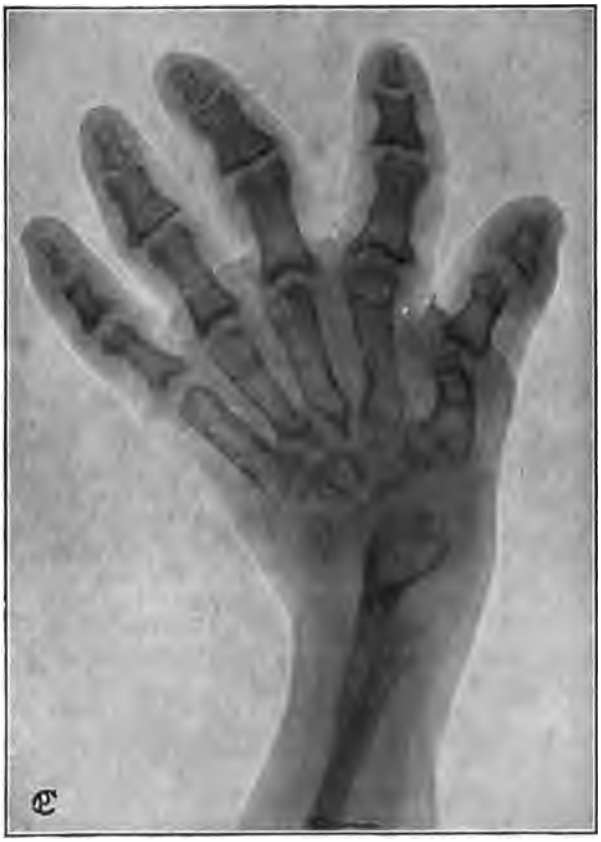

FIG. 115.— Hand of a cretin, showing the undeveloped carpal bones and blunt fingers.

Etiology.— Hereditary factors, such as syphilis, rickets, and tuberculosis in the parents, seem to favor the development of cretinism. The disease rarely occurs in the tropical climates, and we have not as yet seen a colored cretin.

Symptomatology.— Sometimes at the sixth month, or soon thereafter, the mental dullness of the child is noted. It shows very little, if any, interest in its parents or surroundings. Even its toys are unnoticed.

Upon inspection, the face is found to have a stupid, vacant expression, the eyes are dull and are wide apart; the hair is sparse and coarse, the nose flattened and the bridge sunken. The head appears large and is set upon a short thick neck. From the thick lips a tongue apparently too large for the mouth protrudes, and saliva drools from the mouth. The general stature is quite characteristic. The child is markedly stunted, the abdomen appears proturberant, due to the anteroposterior curvature of the spine. The child appears well nourished or even obese. An umbilical hernia is quite generally present. The arms and legs appear short and stumpy.

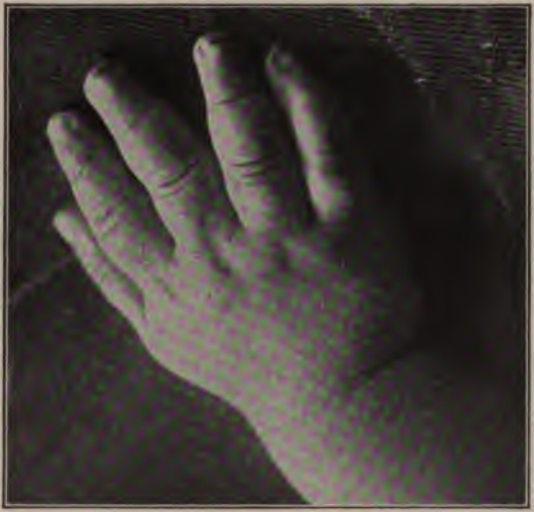

FIG. 116.—Characteristic trident hand found in many defectives.

The hands are spade-like and the fingers blunted; *X*-ray examination shows characteristic changes in the carpal bones. On palpation pads of subcutaneous fat may be felt over the upper part of the chest. The skin is found to be harsh and dry. The subcutaneous fat does not pit on pressure.

The fontanel may be imperfectly closed. If held erect, the peculiar stature and prominent abdomen are intensified. The head will often show a disproportion from the normal, as will the length of the child to its years of life (see Diagram, p. 28). A cretin of eight or ten years may simulate in height a child of two or three years. The temperature is usually slightly subnormal. In older children a history will be elicited of marked mental deficiency. The child does not learn to speak, often showing irritable or vicious temper, with uncleanly habits as to stooling or urination. The teeth are very apt to become carious soon after eruption, and stomatitis is frequently observed. Untreated cases form a good proportion of the so-called dwarfs scattered throughout the country.

The blood examination shows nothing characteristic; usually, however, there is a diminution of the red blood-cells and hemoglobin. The above description applies to the typical cretin; however, we quite frequently meet cases exhibiting a mental deficiency plus some of the physical characteristics outlined above, but in a milder form. In the early months of life the condition often goes unrecognized because the physician has not carefully enough observed and watched the infant. These may be classed as cretinoids. If the examiner will keep this type in mind, he will be more likely to diagnosticate cases in infancy.

Differential Diagnosis.— Mongolian idiocy, achondroplasia, infantilism, rickets, and chronic nephritis must be differentiated from sporadic cretinism.

The Mongolian idiot is small in stature and somewhat mentally deficient, but the distinct slanting type of eyes with the more shapely bodies and their willingness to go about, quite readily distinguish them from the cretins.

Achondroplasia.— The large heads, the very short arms and legs, which are in marked disproportion to the normal body length, added to their fairly well developed intellect, quite readily stamp the diagnosis.

Infantilism.— The symmetry of body and normal mental development are strong distinguishing characteristics. However, the infantile voice and lack of genital development, with the child-like skin, may occasionally lead to a mistaken diagnosis of cretinism.

Rickets.— This condition should not be confounded, as in rickets the mentality is normal and the bony changes are quite characteristic, even when the child is dwarfed by its deformities.

The therapeutic test should be applied whenever there is any doubt.

Prognosis.— The importance of early diagnosis has been dwelt upon, as the prognosis is so much better the earlier the treatment is instituted. Up to the age of puberty comparatively remarkable changes result from treatment. Young adults receive only very meager benefit from the treat-

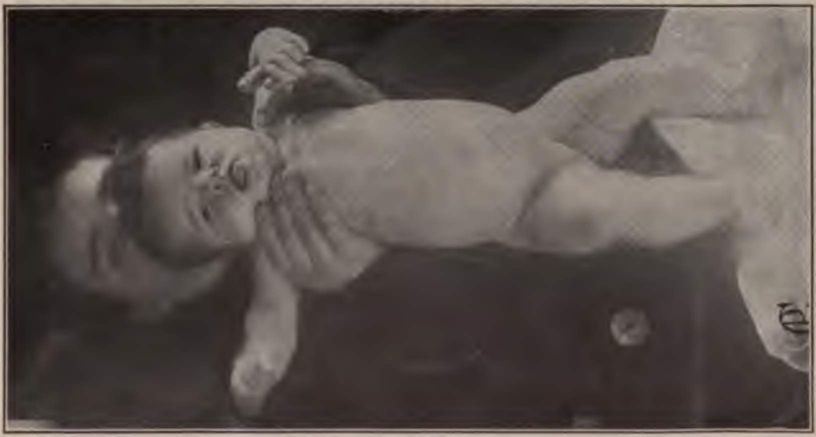

FIG. 117.—Cretin, age 11 months, before treatment. (*Dr. Long's case.*)

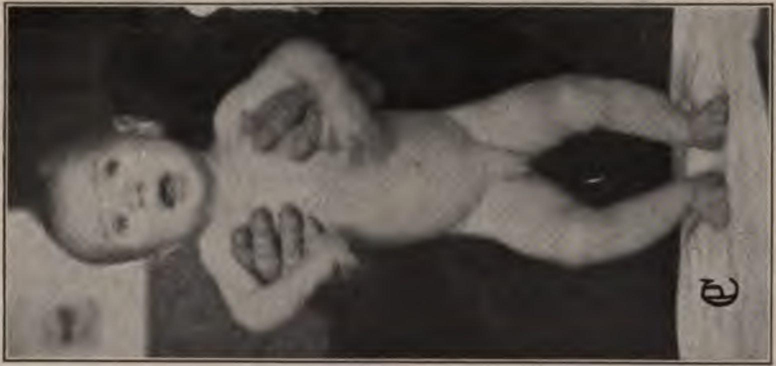

FIG. 118.—Same infant, 47 days after treatment.

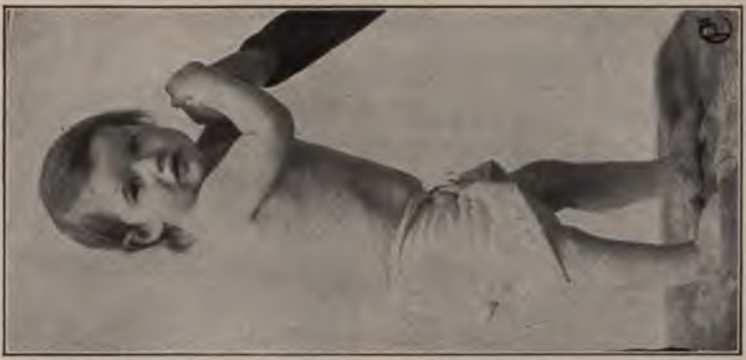

FIG. 119.—Same case after 12 months of treatment.

ment. Untreated cases usually succumb to some intercurrent infection and their mentality remains quite stationary.

Treatment.— Desiccated thyroid extract, if fed to cretins, soon produces wonderful changes in their physical and mental state. Thyroid extract, in large doses, it should be remembered, has a depressing influence on the heart and circulation, and should be carefully given if there is any cardiac lesion. It should be given in increasing doses to infants, beginning with one grain three times a day, and increased slowly to five grains three times a day. Older children may finally take twenty to thirty grains in a day if necessary and if no depressing effect is produced. (A case under our observation had so far improved as to locate the box of tablets hidden in the

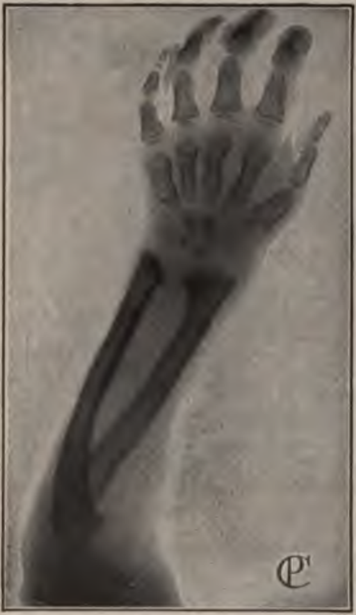

FIG. 120.— Radiograph of hand and arm from FIG. 120, showing undeveloped carpals.

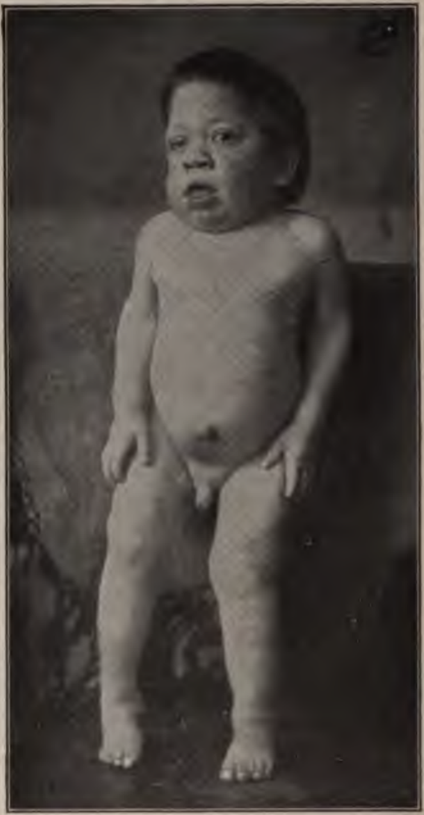

FIG. 121.— Cretin, age 7 years, untreated.

clock. He ate sixty grains in all. He became somewhat cyanotic, but quickly revived under the influence of stimulation.) The treatment must be continued in fairly large doses, until a decided change has been reached

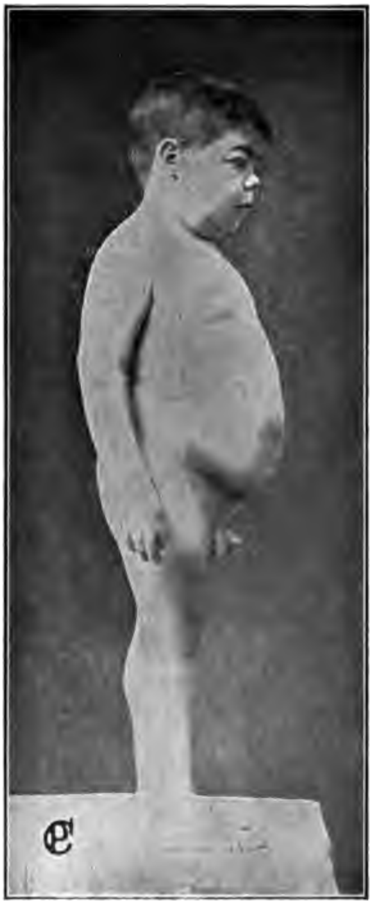

FIG. 122.— Cretin, before treatment. (*Dr. Long's case.*)

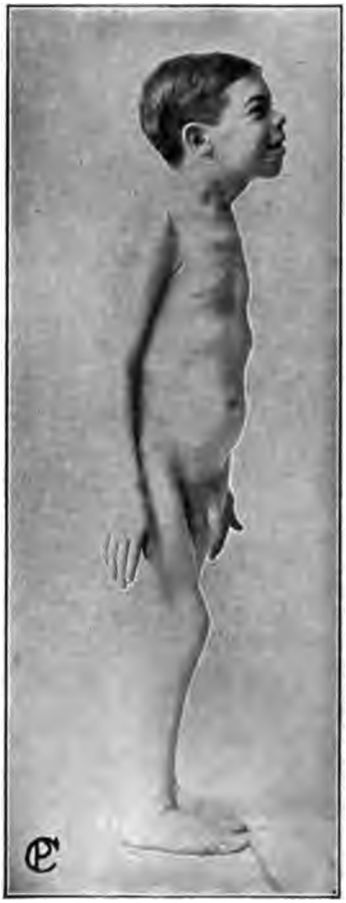

FIG. 123.— Same case after one year of treatment.

and further improvement does not take place. Then smaller doses, that is, about ten grains a week, may be necessary throughout life to prevent a relapse into the former condition. The recession of the tongue, loss of adipose, and lack of drooling are the first signs of successful thyroid therapy.

SECTION X.

GENERAL DISEASES OF NUTRITION.

CHAPTER XXX.

NUTRITIONAL DISORDERS.

Rachitis.

(*Rickets.*)

Rachitis is a general disorder of nutrition, complex in character, which affects the growing organism, and is characterized chiefly by changes in the bones, ligaments and muscles in conjunction with nervous symptoms.

Etiology.— Although a number of theories have been advanced to explain the causation of rickets, none have displaced the generally accepted idea that rickets is a result of faulty nutrition. It is distinctly a disease of infancy and childhood, and generally a preventable one. It seldom occurs before the sixth month of life (although congenital rickets is not unknown), and is rarely seen after the third year.

In this country it is more commonly seen among the children of foreigners, especially the Italians and negroes. While it is undoubtedly more common in Europe than with us, still the number of cases seems to be increasing in our large cities where the hygienic conditions are poor. It is most frequently seen among the children of parents who, themselves, have suffered from nutritional disorders or who have been the subjects of alcoholism or tuberculosis. The enfeebled offspring of such parents are particularly liable to rickets when they live in badly ventilated, sunless quarters and are improperly fed. The food may cause perversion of nutrition because it is deficient in certain elements, as the proprietary foods, or because in quantity and character it overtaxes the digestive functions. It is rarely seen in breast-fed children unless the milk is deficient because of prolonged lactation, pregnancy, or disease. The proprietary foods and condensed milk, if constantly used without the addition of fats, are particularly liable to cause rickets. Under these conditions it may also occur among the better classes.

Pathology.— The greatest changes are found in the bones. Clinical analysis shows that the bony structures in rickets are made up of two-thirds organic matter instead of one-third, as found in normal bones of this age. A cross section of a long bone at its junction with the epiphysis shows an enlargement and an increase in the cartilaginous structure, which is engorged and vascular. The periosteum is easily removed and the medullary portion is soft and traversed with trabeculæ. The long bones may be soft and brittle in an early case, but in cases of long standing they become unusually firm and hard. In the bones of the skull similar periosteal changes occur which produce abnormal ossification and calcification. Many of the ligaments are imperfectly developed or abnormally stretched. The spleen is enlarged in about 10 per cent. of all cases. The liver and the spleen may be forced downward by thoracic deformities.

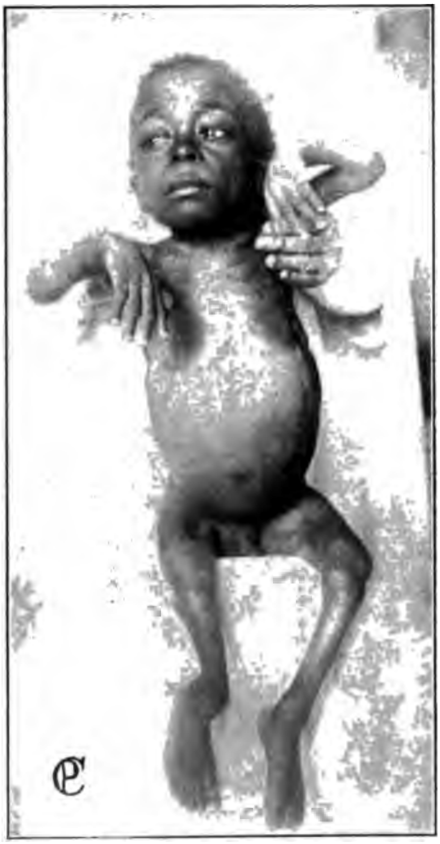

FIG. 124.— Extreme rachitis, showing marked bony deformities.

Symptomatology.— The *first evidences* of rickets may escape attention unless the examiner considers the possibility after obtaining the history. Among the early signs are fretfulness, disturbed sleep and excessive perspiration about the head, in an anemic child. It is not easily comforted, and cries when moved as a result of muscle tenderness. In cases of longer standing, physical examination will show backwardness in development. The infant may be unable to hold up its head, to sit up, or stand as a normal child at the same age. The muscles are, in general, soft and flabby, the abdomen is distended and tympanitic, and evidences of imperfect digestion are found in the fetid stools and in the constipation alternating with an occasional diarrhea. In spite of this the appetite is generally good, more food being taken than is digested.

In *more advanced* cases the spleen is palpable, and the anemia becomes more marked. The subjective symptoms above recorded become more intensified, and changes in the bony skeleton occur which can be felt on palpation. Among these the beading of the ribs at the costochondral junctions forming the so-called rachitic rosary is the most characteristic. In infants parchment-like areas occur in the occipital bones, known as craniotabes, a finding which helps to establish the diagnosis.

At the junction of the epiphysis and diathesis nodular bony enlargements are felt, particularly at the wrists, ankles, and knees. The forehead is marbled with enlarged veins and in shape is squared in front and flattened on top. The fontanels are late in closing, even the line of the sutures being palpable. Bosses may be felt in the center of the parietal bones and near the base of the temporal bones. At this stage there is generally an evening rise of temperature and an accelerated pulse rate. The body weight may remain stati may be very irregular. Dentition is

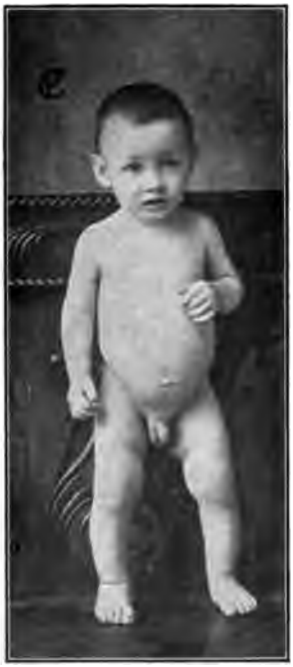

FIG. 125.— Rachitis, mild form, with bow-legs.

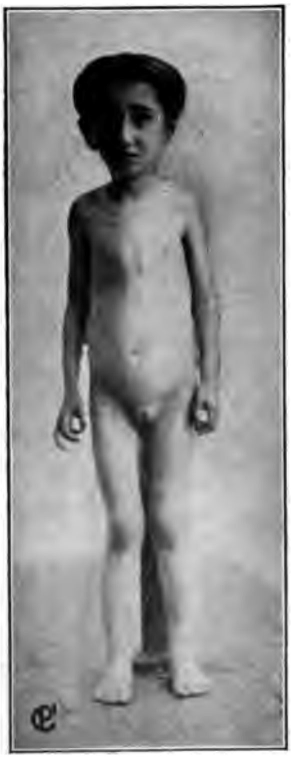

FIG. 126.— Rachitis, showing pigeon-chest deformity.

a very irregular process. The first teeth are frequently delayed, sometimes erupting only during the second year, and then with much discomfort. They easily decay, sometimes eroding almost to the gum.

Nervous Phenomena often develop in the rachitic infant. Among these the most characteristic is laryngismus stridulus. This glottic spasm may occur several times a day and sometimes results in carpopedal spasms. In others nystagmus, tetany, or inspiratory crowing develops from the nervous instability. Convulsions are not uncommon and recur from apparently slight causes.

Deformities occur later in the disease as a result of the softened condition of the bones and the relaxation of the ligaments. Besides the deformity of the head, the thorax shows marked changes. The rachitic rosary becomes more marked, due to a sinking in of the ribs in the axillary line and a flaring out of the ribs below.

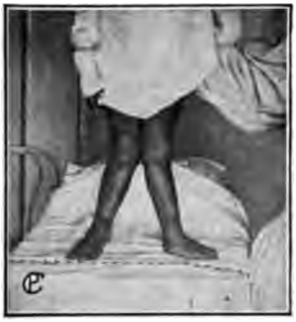

FIG. 127.— Knock-knees in a rachitic child.

The thorax may be more or less funnel-shaped and appear very narrow at the clavicles, due to the abnormal flaring below. The sternum may be drawn inward or pressed forward, causing the pigeon-breast deformity. The anteroposterior diameter of the chest may be increased while the transverse diameter is lessened. Not infrequently a well-developed groove or sulcus is formed running from the ensiform on either side of the scapular line. This is known as Harrison's groove, and results from the pull of the diaphragm, introthoracic pressure and the abdominal distention. These thoracic deformities necessarily affect the organs and structures within. The lungs are impeded in their action, favoring the production of bronchitis, pneumonia, and pulmonary collapse. The heart action and circulation may be impaired with a resulting cyanosis. Pneumonic affections are peculiarly resistant to treatment, and their chronicity may be responsible for lymph-node enlargements at the root of the lung.

The bones of the extremities now show other changes besides the epiphyseal enlargements at the wrists and lower end of the tibia, which occur very early in the disease. The humerus may be curved outward, while the legs are deformed from the weight put upon them in efforts to stand or walk. Bow-legs, knock-knees, and deformities of the foot are thus produced. The peculiar sitting posture of these children sometimes induces curvature of the femur.

The spine, owing to the relaxed condition of the ligaments, bony changes, and deficient muscular power, loses its normal curves, eventually becoming bowed from the cervical region to the pelvis. Lateral curvatures or scoliosis result from postural positions assumed while being carried in its mother's arms. The pelvis may suffer with the remainder of the skeleton, becoming flattened or shortened in its anteroposterior diameters.

The blood shows no characteristic changes. Simple anemia is always present. The hemoglobin may be reduced to 40 or 50 per cent. A moderate leukocytosis is occasionally obtained.

Diagnosis.— There is no difficulty in making the diagnosis in well-advanced cases. In the early stages sweating of the head, anemia, marked restlessness at night, irregular dentition, pseudoparalysis, and a distended abdomen in a child exhibiting abnormal nervous symptoms, are often sufficient to suggest the diagnosis.

Infantile paralysis may be distinguished by the electrical reaction or by obtaining mobility in the prone position by irritating the plantar surface of the foot.

In hydrocephalus (see Fig. 145) there is a true enlargement, in place of an apparent enlargement, of the circumference of the head, with a bulging fontanel. Syphilitic affections are monoarticular, while many joints are simultaneously affected in rickets.

In Pott's disease the spinal deformity is angular and rigid, causing pain when attempts at motion or pressure are made.

Course and Prognosis.— The disease itself, while chronic, has a tendency to arrest or recovery when changes are made in the dietary and surroundings of the patient. But even if a cure results, many of the bony deformities remain. While it is seldom a fatal disease, it influences the mortality in early life because of the lowered resistance which it engenders. These children more readily succumb to respiratory, intestinal, and infectious diseases. Under suitable treatment the disease may be arrested after two or three months, and further bony changes prevented. Nervous symptoms, such as laryngismus stridulus, are very promptly controlled when the proper treatment is instituted.

Treatment. Prophylactic.— The education of mothers and of school girls by settlement workers in matters pertaining to the feeding and hygiene of infants will do much to reduce the number of cases. Frequent regulation and supervision of artificially-fed babies by their physicians would prevent overfeeding with too strong formulæ which so often occurs among the more intelligent classes. Examination of the breast milk in children who are not sufficiently developing may show a marked deficiency in the proteins or fats. Milk of this character may cause the development of rickets. Mixed feeding and improvement in the secretion should be attempted by proper food.

Dietetic Treatment.— Dietetic instruction for the mother, an outdoor life, and cleanliness are the necessary requirements for a cure. The food in the case of an infant must contain a sufficient amount of proteins. If the feeding has been on condensed milk and high dilution or the proprietary foods, properly modified cow's milk will in a short time produce a marked improvement. The modifications recommended for difficult cases of infant feeding should be studied in this relation, as the change must be so made that it will be compatible with the defective assimilation which is usually present.

Older children should have a diet list especially prepared for them, which may contain fresh raw milk, yolk of eggs, butter, leguminous gruels, and vegetables suitable to their age.

Hygienic Treatment.— Provision should be made so that the child may live as much as possible in the open air. In bright sunny weather at least five hours a day should be spent out of doors. A roof or a room with a sunny exposure and with open windows may be utilized for this purpose. Daily baths to which a pound of sea salt is added are given, unless contraindicated by muscular tenderness. Mild forms of massage, breathing exercises, and gymnastic treatment given in the second year of life are productive of good results.

Medication.— With the exception of cod-liver oil or olive oil, which is of value in older children, drug treatment is of little avail. Iron and arsenic may be given for the anemia after progress has been made in proper food assimilation. If phosphorus is administered, the oil or the elixir may be used, although this drug and the lime salts have not proven of any benefit in our experience.

Deformities of the long bones may be prevented by not allowing the child to assume wrong positions and not encouraging him to stand or walk until the softness of the bones is overcome. The rachitic spine is corrected by keeping the child in the horizontal position in bed or on a frame. Surgical measures to correct bow-legs and knock-knees are necessary in the advanced cases.

Congenital Rachitis.

(Antenatal Rachitis.)

Rarely we see infants born with well-marked evidences of rickets. The rachitic fetus develops the affection in its intrauterine existence, probably during the placental period of nutrition in consequence of disease or starvation in the

pregnant mother. The infant is born with changes in the bony skeleton which, although not well-marked, resemble those in a lesser degree found later in rachitic infants. Craniotabes, enlarged epipyses, and beaded ribs may be seen and palpated.

Scorbutus.

(*Infantile Scurvy; Barlow's Disease.*)

Scorbutus is a constitutional disease due to a prolonged faulty diet and characterized by pain and swelling in the extremities, and hemorrhages into the skin and mucous membranes.

Etiology.— Proprietary infant foods, the continued use of sterilized and incorrectly pasteurized milk, food almost exclusively of one kind, as condensed milk or cereals alone, are the factors which produce the necessary predisposition to intestinal putrefaction and toxemia. and which may result in scurvy after some weeks or months. Although it occurs in children under two years of age, the latter half of the first year shows the greatest number of cases. Malnutrition from food not adequate to maintain development is also a causative factor of importance. The chemical changes brought about in the food by boiling or evaporation in dry heat for the purposes of preservation are essentially the underlying cause of the disease. The cases occur more frequently among the well-to-do than among the dispensary cases, as the latter cannot afford proprietary foods, and much sooner give a mixed diet.

Pathology.— Subperiosteal hemorrhages occur in the long bones, especially in the tibia and femur. The epiphyses show similar changes, usually in proportion to the involvement of the periosteum of the shaft. In some cases the periosteum itself, close to the bone, is infiltrated and thickened. The ribs in marked cases show these changes, especially on their margins. The spleen may be found enlarged and hemorrhages occur in the pericardium, pleura, liver, and into the muscles.

Symptomatology. Mild Cases.— **Attention is usually** first attracted to the infant because it cries when handled. The tenderness is especially marked about the lower extremities. The child is extremely fretful, and usually anemic. It is not uncommon to obtain a history of some fancied injury which may be misleading. The infant will hold the limbs motionless, usually in a position of flexion, and cries or screams when any attempt to disturb them is made. In some cases only one extremity may at first be tender. No fever and no swelling may be present at this stage in the early or mild types. Such a train of symptoms, when present in conjunction with a history of prolonged feeding with artificial foods which lack the essential quality of freshness, should be suggestive and the therapeutic test applied.

If swellings are noted over the epiphyses in one or both extremities, with swelling and engorgement of the gums, the diagnosis is quite certain.

Aggravated Cases.— In these unrecognized or neglected cases, hematuria may be the first symptom for which the child is brought to the physician, or it may have been treated for rheumatism because of the swelling and pain at the ankles. Careful examination will show spongy gums, bluish in color, which may bleed on pressure. If teeth are present the gums override them, and ulcerations may be seen. Anemia is a constant symptom. The appetite is lost, the child cries constantly when handled, and blood may appear in the stools. In exceptional cases blood is effused into the joints and the epiphyses may separate. Ecchymotic areas appear under the skin, especially over the swellings on the lower extremities, but may also appear over the ribs. Concomitant rachitic changes may also be noted due to the nutritional faults. About the orbit, conjunctival hemorrhages may be seen or even protrusion of the eye-ball. The face is usually swollen, or even edematous. Albumin and casts are sometimes found in the urine.

A collective investigation by the American Pediatric Society gave the following symptoms in their order of frequency: Pain and tenderness of the extremities, sponginess or puffiness of the gums, disability, anemia, cutaneous hemorrhages, hemorrhage from the rectum and hematuria.

Diagnosis.—Infantile scurvy is rarely mistaken by those who are accustomed to obtain a good history and who make a systematic examination. Traumatism, acute infectious arthritis, and osteomyelitis are differentiated by the swelling, which is mainly over the shaft of the bone, the absence of temperature, swollen gums, ecchymoses in the skin, pseudoparalysis, and blood in the urine and stools. A radiograph will in questionable cases complete the diagnosis.

Course and Prognosis.— The prognosis is very good when the disease is recognized in its early stages and prompt treatment instituted. The development of rickets or extreme malnutrition may delay the cure in aggravated cases.

The great majority, even the neglected cases, recover under antiscorbutic treatment. Beneficial results are noted after a few days, the mild types showing remarkable changes within a fortnight.

Treatment. Prophylactic.— The disease can be prevented by the use of some orange juice and untreated cow's milk in the dietary. Overanxious mothers should be warned against repasteurization of their infant's milk supply. Since so much of our milk is now pasteurized, some orange juice should be given in conjunction with the formula, at least at the sixth month. Milk treated by the holding method of pasteurization is not likely to cause scurvy.

Dietetic Treatment.— The food should be abruptly changed; fresh raw milk, properly modified, is allowed. Orange juice, one ounce daily in divided doses, and expressed beef juice about one ounce during the day, in addition, are readily taken. Older children should be given mashed potatoes and minced vegetables, such as carrots or spinach. The limbs are encased in cotton wool and supported on a pillow until the tenderness disappears. Unnecessary handling should be avoided. Removal to the outer air should be made with the infant in its crib or on a pillow. The anemia needs no drug treatment, as it disappears under the dietetic management outlined above.

Marasmus.

(Infantile Atrophy; Athrepsia.)

Marasmus is a very common functional disorder in infancy, characterized by extreme emaciation resulting from inability to assimilate food.

Etiology.— This is still obscure. It is usually seen in the first year of life. The greatest number of cases appear in institutions and in dispensary practice. Undoubtedly food poor in quality and given in great quantities, coupled with unsanitary surroundings, have a distinct etiologic bearing on the development of marasmus. If the digestive secretions have not been sufficiently developed by proper food, or if they have been overproduced for some time in efforts to digest abnormal food constituents, then the disorder may insidiously appear with symptoms of acid intoxication.

It is rarely seen among breast-fed infants unless there is a marked perversion of the supply.

Pathology.— The gross lesions found in even a well-marked case of marasmus are surprisingly few. Microscopically, nothing characteristic can be described. The body is devoid of adipose tissue. The muscles are soft, pale, and thin. The overlying skin is dry and wrinkled. Hemorrhagic areas are frequently seen beneath the skin and sometimes in the mucosa of the gut. The lungs are frequently involved, showing either hypostatic pneumonia, bronchopneumonia, or atelectatic areas. We have found these often in combination. The liver is somewhat enlarged and fatty. The spleen may be soft, but is not enlarged. The kidneys show degenerative changes or at least a cloudy swelling. The heart is small, with pale muscle fibers. The mucous membrane of the intestinal tract is extremely thin and pale. The stomach is usually dilated, and its lining is covered with ropy mucus. The agminate and solitary follicles stand out heard, most noticeable at the apex and transmitted toward the axillary more prominently and give the "shaven beard" appearance. The villi are not easily found, or in some cases are entirely absent. The lymph nodes are enlarged. In some cases connective-tissue changes take place in the intestinal mucosa in isolated patches.

Symptomatology.— The train of symptoms begins insidiously. The mother usually brings the infant because she has noted emaciation in spite of the fact that the food has been the same or even increased in amount. The loss of weight, if recorded, is found to be steady but constant. The muscles become soft and flabby. The skin is loose and wrinkled. The facial appearance changes, due to the loss of fat, with a wrinkled forehead and sunken cheeks. The fat pads over the buccinators in young infants remain, however, almost to the end. The abdomen and thighs show the emaciation quite early. The skin feels harsh and dry, and has lost its elasticity. The muscle tone, especially over the abdomen, is lacking. The emaciation progressing further, gives an "old man" expression to the face. This outward wasting that takes place corresponds with changes in the heart muscle. The pulse becomes weak, and anemia of a simple kind is present.

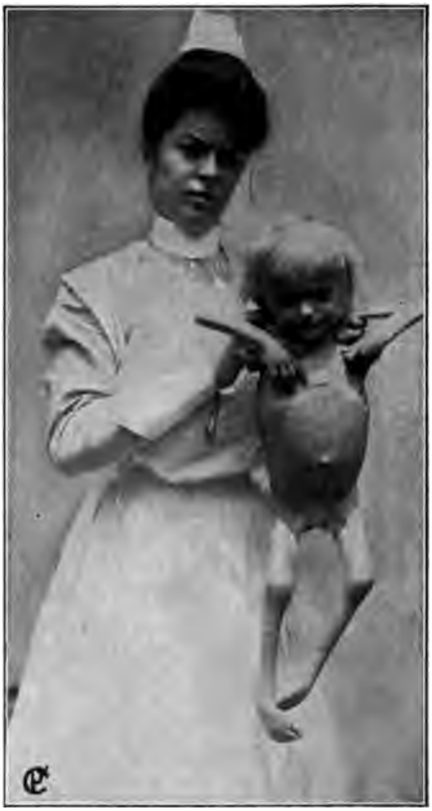

FIG. 128.— Marasmus.

A striking feature is the insatiable appetite. The infants will take an enormous quantity of food and still cry as if unsatisfied. The stomach dilates and vomiting may occur. The abdomen is distended with gas, and the liver may be palpated well down in the abdomen. The stools vary considerably. As a rule, they are mixed in color, with a greenish-yellow cast predominating. They contain much unchanged food, and the bulk is decidedly increased. The odor is musty and foul and almost characteristic. Diarrhea may follow after several days of constipated movements. Erythemata in the napkin region develop and persist. The temperature is rarely much above normal, although subnormal readings are not uncommon. The thirst in some cases is extreme; the infants have a red, dry, and glazed tongue. A finger or the hand is sucked continually, which the mother attributes to hunger. The cry is a low moan or whine, and is not repressed when attempts at comforting the baby are made. In fact, it often cries more when disturbed. As the disease progresses the emaciation becomes extreme; the child resembling a living skeleton. The fontanel and eyeballs are sunken. Excoriations and bed-sores develop easily. Stomatitis is not infrequent. Otitis may develop. The breathing becomes shallow and feeble. Pneumonia, usually of the hypostatic variety, or convulsions, frequently bring on the fatal termination.

If the disease is arrested, the improvement is noted first in the stationary weight and improved condition of the stools. Later slight gains are made, however, with frequent discouraging remissions. Finally the gain is steady, but slow.

Course and Prognosis.— The course is long and tedious, and even when improvement begins months are needed to regain a normal appearance and development. Unless the conditions are eminently favorable, the prognosis is extremely poor, the infant usually dying of some intercurrent disease.

Treatment.— Since the disorder is the result of defective assimilation, and artificial feeding being at best the introduction of a foreign food, a good wet-nurse (see p. 107) should be secured whenever this is at all feasible. Maternal milk even for one or two months has been sufficient in our experience to turn the balance from inevitable disaster to beginning success. A change of surroundings, especially in the case of the poor infant, is the next consideration. A life in a country district, with plenty of fresh air and sunshine, is of the greatest importance. These infants should not be placed or taken for treatment in hospitals or asylums. Treatment in homes, preferably in the country, which are under the direct supervision of a physician, is much more satisfactory. If the child is being breast fed it may be found after examination that the character of the secretion may be improved, and meanwhile mixed feedings can be tried. If in spite of this no gain in weight is made, a radical change of the milk must be made.

If artificial feeding must be resorted to, the problem is a very difficult one, and will demand a knowledge of the principles of infant feeding, so that the food may be adapted to the needs of the case at hand. A detailed history of the previous feeding is essential, and it is not unusual to find that these cases have gone through the gamut of almost every conceivable food in an effort to find something that will agree with the baby.

Begin the dietetic management by clearing out the intestinal tract with calomel or castor oil. If there has been vomiting, lavage is indicated once a day for two or three days. A daily irrigation of the bowels with saline solution for the first week is rarely amiss (see pages 73 and 74).

Feedings should be small in quantity, and contain at first protein and fat slightly above the caloric value necessary to maintain life. The gruel diluent should be converted by a diastatic ferment, and, if necessary, the milk may be peptonized. It is a good rule not to prescribe, no matter what the age, greater percentages than 2 per cent. fat. On the contrary, skimmed milk, fat free, up to two ounces to the pound of body weight, will usually be tolerated. Not infrequently the marasmic infant does not do well on any ordinary milk modifications, because the infant has been neglected too long or fed upon foods which do not react to the rennin in the stomach. Legume gruels, one to two ounces of the flour to the quart, with the addition of one teaspoonful of pineapple juice to each four ounces of feeding, is given until the stools change in character. Whey alternating with the legume gruel (see section on Infant Feeding) is then cautiously tried, and as soon as it is tolerated, the yolk of one egg rubbed up with a quarter of a teaspoonful of sugar, is fed daily from a spoon. Milk may now be added gradually to the whey, and this mixture may entirely replace the gruel. If gain in weight is made and development progresses, milk and gruel mixtures containing 1.5 per cent. of protein, with the addition of sodium citrate, one grain to the ounce, may be given so that the rennin action may be controlled. As the digestive secretions improve the infant is able to adapt itself better to the form of food prescribed, and in this resembles again the normal baby.

Progress will only be made by careful attention to every detail and a study of the stools before making any advances in the strength of the food. The fats may be kept low with advantage; the protein being raised if the dejecta appear to warrant it until a satisfactory gain in weight is being made.

Medication is only indicated to support the strength until the dietetic measures are sufficiently advanced to support life. For this purpose strychnin is valuable. Alcohol in any form, if given for any length of time, does more harm than good. Bismuth is occasionally necessary to allay intestinal irritation.

Baths are decidedly helpful adjuncts in the management. Brine baths are especially valuable. They are given warm and followed by a brisk alcohol rub daily. Asthenic cases may at first need subcuticular injections of normal saline solution, or if the nutrition is sadly impaired, a 10 per cent. solution of dextrose can be injected in the attempt to save life.

Diabetes Mellitus.

This is a condition of persistent glycosuria rarely seen in childhood, and differing from the same affection in adult life by rapid wasting and a speedy fatal ending.

Etiology.— While rarely, if ever, seen in young infants, the disease may occur in children, oftenest between the ages of five and ten years. Heredity is supposed to act as a predisposing cause, and a diet containing excessive amounts of starch and sugar may have a causative influence. The real cause and pathology of diabetes mellitus are as obscure and uncertain in the child as in the adult.

Symptomatology.— Among the earliest symptoms noted is an excessive thirst. A child who has been previously well-nourished, besides drinking great quantities of water, is seen to be listless or irritable, easily tired and with a large and capricious appetite. Failure of nutrition and strength soon follow, and in a short time, possibly within a few weeks, the wasting becomes very appreciable. The urine is passed frequently and in large amounts. Several quarts may be voided in the twenty-four hours. The specific gravity is high, as in older subjects, and large quantities of sugar and occasionally diacetic acid and acetone may be found. Nocturnal incontinence is usually present. Irritation of the genital organs is sometimes caused by the passage of the sugar. The skin and mucous membranes are apt to be dry, and the former may show patches of eczema and occasionally boils. Itching of the skin may be marked and annoying. The wasting and loss of strength proceed with great rapidity and death is apt to ensue from exhaustion. In some cases the fatal ending is due to an intercurrent pneumonia and in others to diabetic coma. The disease generally runs its course within a few months and usually under six months. The younger the child the more rapid is apt to be the course of the disease.

Prognosis.— We have never seen a case recover in a young child. In any given case of glycosuria, the only hope is that the condition is temporary and due to an excessive ingestion of starches and sugars, the so-called alimentary glycosuria. There will then be an absence of wasting and the other symptoms previously noted.

Treatment.— The diet must consist, as far as possible, of milk, meats, fats, eggs, and green vegetables. Von Noorden recommends oatmeal that has been long and thoroughly cooked, which then appears to be well borne by diabetics in spite of its starch, and he thinks it has a curative tendency. The weakness may be combated with alcohol and strychnin. Small doses of codein may also be tried.

SECTION XI.

DISEASES OF THE UROPOIETIC SYSTEM.

CHAPTER XXXI.

DISORDERS OF THE URINE AND KIDNEYS.

The Urine in Infancy.

The somewhat vague and conflicting reports concerning the early secretion of urine are due to the difficulty of collecting it. The following methods have heretofore been relied on: Placing a small sponge or piece of absorbent cotton over the parts, which is intended to be saturated with the urine, and then squeezed out; in females, fitting a cup or wide-mouthed bottle or pus basin under the vulva to be held in place by the diaper; in males, placing a bottle or condom over the penis and holding it in position by straps of adhesive plaster. When these methods fail, as often happens, the only resort left has been the catheter, a soft-rubber catheter, about 6 size, being best to employ. In females, where the greatest difficulty is usually encountered, the employment of a catheter is not always easy, and several preliminary passages into the vagina often occur in the hands of the inexperienced. To obviate these difficulties and to make easy and safe the routine collection of the infant's urine for examination, a special urinal has been devised. It consists of an oval opening ending in a funnel that fits into the collecting vessel. For efficiency of application, two sizes have been found necessary. No. 1. (Small size). For infants under one year. No. 2. (Large size). For infants over one year.

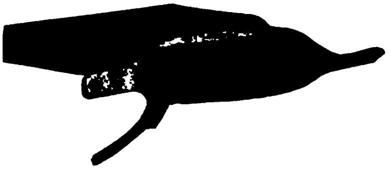

FIG. 129.—Chapin's infant urinal.

Place the large opening around the vulva in the female and over the parts in the male with the funnel pointed downward. Put tapes through the opening in the arms and fix by tying around the abdomen and both groins. To fix more firmly in place, put strips of plaster over the arms. Place the end of the funnel in the collecting bottle, which is kept in place by the diaper. If the infant is very restless, put a cork in the end of the funnel and dispense with the bottle.

It was hoped that this apparatus would enable one to collect the full amount passed in twenty-four hours, but this has not proven feasible without constant watching, as the movements of the baby make a small leakage unavoidable.

Character of the Urine.

That the kidneys functionate before birth is shown by the bladder usually containing urine just after birth, and from traces of this excretion in the liquor amnii. The kidneys at this time are of relatively large size and more distinctly lobulated than in later life. There is a great discrepancy among the various writers as to the amount of urine passed during the early days of life. All agree that the infant passes a relatively greater amount of urine than the adult. Parrot and Robin state that the new-born passes four or five times more urine, per kilogram of its weight, than the fully-grown subject. They also found that the urine at this time has always about the same composition, whether passed in the morning or evening. The quantity and product of each urination varies but little as the infant has no urine of sleep, digestion, etc., since he takes an identical food and at nearly the same intervals of time. These authors found that the morning voiding varied from 10 to 30 c.c. Small quantities may be voided every hour through the day and several times at night. There seems to be a concensus of opinion among various observers that during the first few days

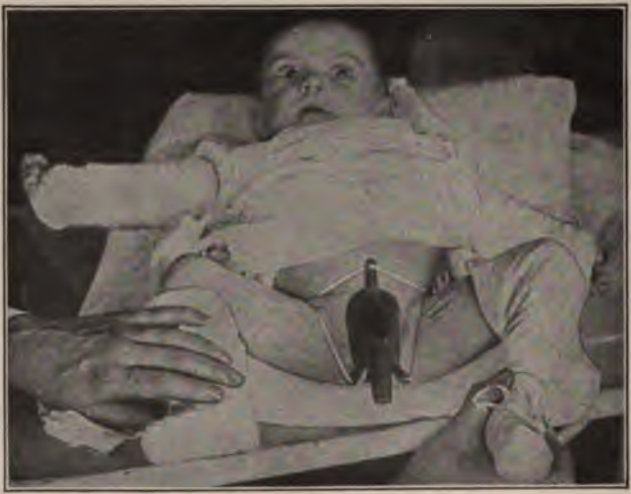

FIG. 130.—Chapin's infant urinal applied.

the young infant excretes about from one to three ounces of urine, and after this the quantity rapidly increases. At the end of the first week there may be from three to twelve ounces; at six months, twelve to sixteen ounces; at one and two years, from sixteen to twenty ounces; from two to five years, twenty to thirty ounces, and after that, approximating the adult. It must be confessed that these figures are general and tentative and seem to be a fair estimate after considering many conflicting figures of the various writers. The amount will vary in proportion to the quantity of fluid given as well as the action of the bowels and skin.

The specific gravity is low, rarely rising above 1010 during the first six months. A few days after birth and until the end of the first month the specific gravity is very low, only averaging from 1003 to 1004, as urea and inorganic salts are not found in large quantity at this time. It then increases in density, but it is not apt to rise much above 1010 until after the tenth year, when it may reach as high as 1020.

The first urine is clear colored, although it is sometimes reddish from an excess of uric acid and urates. In the latter case it may be scanty and passed by drops which discolor the diaper. The uric acid crystals may even form concretions in the pelvis of the kidney. Infants seem to form uric acid with great facility, but the proportion of uric acid to urea diminishes later, though comparatively large all through childhood. In proportion to the body weight there is relatively less urea excreted by the infant than by the child, although the latter excretes more than the adult. This may be accounted for by the active metabolism occurring in early life.

The reaction is usually neutral or faintly acid. In the cases mentioned where large amounts of uric acid are formed and eliminated during the few days after birth, the reaction will be markedly acid. The reaction may be at times slightly alkaline without being considered abnormal.

The question as to the presence of what may be considered pathological ingredients at this time and their significance is interesting, but one upon which various writers are not in accord; some state that traces of albumin and hyalin casts are occasionally found during the first days of life and with little significance. Hyalin and even occasional granular casts may be found in the urine of the newly-born. Slight glycosuria has occasionally been reported during the early months, especially when sugar has been too freely given in the food. All through infancy traces of indican will be found in connection with gastrointestinal irritation.

During the early years of life slight renal hyperemia appears to be very easily induced and to be coincident to almost any marked bodily disturbance.

The rapid metabolism occurring at this time of life and the vulnerability of the kidneys will occur to everyone. A careful examination of the urine in various conditions is presented in the following series of cases from the babies' wards of the New York Post-Graduate Hospital. The first series includes eighty-six cases in which some disturbance of the gastrointestinal tract was present. No attempt was made to classify these cases, and they include simple indigestion, fermentative diarrheas, intestinal inflammation and marasmus. In a large number the condition was not severe, and such cases were purposely included in the list. Albumin was present in seventy-five cases in this series of eighty-six. Its presence was noted as follows: trace, twenty-nine; faint trace, thirty-one; heavy trace, fifteen. Casts were present in thirty-seven cases, noted as hyalin, granular, epithelial, and mucous. There were sixteen deaths in the series, and of these fourteen had albumin present and ten both albumin and casts. In thirty-two cases an examination for indican was made and found present in twenty-two of the cases. The amount was estimated as follows: trace, four; faint trace, one; heavy trace, seventeen.

A series of fifty-seven cases of pulmonary diseases, such as severe bronchitis, pleurisy, and pneumonia, gave the following results: forty-nine had albumin in the urine, thus noted; trace, thirteen; faint trace, thirty; heavy trace, six. Thirty-two cases had casts present, either hyalin, granular, epithelial, or mucus. Of the seventeen deaths in this series, fifteen had albumin present and ten both albumin and casts. An examination for indican in twenty-three specimens shows its presence in sixteen cases. Trace, two; faint trace, two; heavy trace, twelve.

In forty-five cases of general illness, other than pulmonary and gastrointestinal, albumin was present in thirty-one cases. Trace, nine; faint trace, eleven; heavy trace, eleven.

In eleven cases of cerebrospinal meningitis, nine showed heavy traces of albumin and casts.

In a number of cases of cerebrospinal meningitis, with coma, a special effort was made to collect the twenty-four hours' amount. A baby of nineteen months passed 18 ounces, one of two years passed 16 ounces, one of three years passed 16 ounces, and one of four years passed 20 ounces. All of these specimens had traces of albumin and casts, and the urea varied from 1.7 to 2.7 per cent.

It is evident that any disturbance of the bodily functions during infancy will often be accompanied by the presence of albumin and casts in the urine. Actual renal disease should not be considered to exist when only traces of albumin and a few casts are found, this is simply an irritation of the renal tubules accompanying a slight congestion and having no special significance.

It would seem that we are justified in concluding that the urine of infants may contain traces of albumin and even casts without any very grave results. Even when actual congestion or parenchymatous inflammation exists for quite a long time, it may be remembered that in early age the kidney possesses a wide power of regeneration.

The exceedingly fine tests now often employed in examining for albumin must be noted as one explanation of its frequent discovery. As small amounts of nucleoproteid are always present in urine, probably derived from the disintegration of the epithelial cells from some part of the urinary tract, such as the ureter or bladder, fine traces of albumin may come from such a source.

Formation of the Kidney.

First are noted two minute oval structures appearing about the seventh week of fetal life. As these masses develop into the kidneys, they assume a marked lobulated form, and this structural peculiarity persists until shortly after birth when this distinctively lobulated structure disappears. The kidneys are relatively larger in the new-born than in older subjects and are placed a little lower down in the abdomen. The suprarenal capsules nearly cover the kidneys at first and are relatively large all through childhood. Malformations have been rarely noted, such as a fusion of both kidneys into an irregular, horseshoe mass. Congenital cystic kidneys have been occasionally reported due to stenosis of the pelvis, ureters, bladder or urethra, followed by a dilatation of the capsules of the Malpighian bodies and of the tubules. As a result, the kidneys may be greatly enlarged, consisting of a mass of cysts. A few cases of single kidney, supernumerary ureters, and other rare anomalies have been reported in the literature of the subject.

Anuria.

This term applies to a cessation of the urinary secretion. In the newly-born note should always be taken of the first passage of urine. Its non-appearance may be due to some congenital malformation in any part of the urinary tract. Delay in voiding at this time is most commonly caused by uric acid infarction in the kidneys. The highly acid urine may then pass in drops which dry upon the diaper and the nurse will report that no urine is being passed. Sometimes a reddish-brown, brick-dust discoloration is left upon the diaper, and the inexperienced may think that the infant has been passing bloody urine. There may be anuria for twenty-four hours from this cause without the infant showing any constitutional disturbance. Examination will usually show that the bladder is empty. There are occasionally cases in young infants where no urine is passed from twelve to twenty-four hours, as far as can be seen, and, as long as there is no apparent bodily disturbance, it need not cause undue alarm. In older children anuria may be caused by various drugs, such as phosphorus or arsenic; by nervous disturbances, as from fright, hysteria, etc.; there may likewise be complete suppression in the course of acute nephritis.

Treatment.— Before deciding that a case is one of true anuria, the bladder must be examined to be sure that we are not dealing with ordinary retention. To be absolutely sure of this, it may sometimes be necessary to pass a catheter. A soft-rubber catheter, carefully sterilized, about 6 size, is best employed in the young infant. When there is actually a stoppage of the urinary excretion, the kidneys may be stimulated into action by slowly injecting into the bowel large quantities of warm normal salt solution. Hot fomentations over the kidneys may likewise be tried. The best diuretic is pure water given frequently and freely. When the urine is scanty and very acid, the young infant may be given from one to three grains of citrate or acetate of potash every two or three hours in a tablespoonful of water. Obstinate cases may respond to agurin gr.v to a five-year-old child three times a day.

Polyuria.

A temporary increase in the amount of urine excreted may be caused by the administration of large quanties of fluid, such as milk or water, by irritation of the base of the brain, by hysteria, by the cirrhotic form of nephritis, or by diuretics. As a rule, the condition is due rather to functional than organic disturbance.

Diabetes Insipidus.

When polyuria assumes a chronic form and there is a daily excretion of large quantities of pale-colored urine having a very low specific gravity, the condition is known as diabetes insipidus. The real pathology of this disease is not understood, but the prevailing opinion is that it owes its inception to some sort of neurosis. The causes are obscure, but cases have been reported where heredity seemed to be a factor and others seem to be coincident to injuries of the brain induced by falls or blows, and to the various forms of meningitis. The disease begins early in life, the majority of the cases reported being under ten years. An evacuation of very large quantities of watery-looking urine is characteristic of the disease, even as much as ten quarts may be passed daily. The specific gravity is very low, varying from 1001 to 1005, and the urine contains neither albumin nor grape sugar. Urination is frequent and may reach a condition of incontinence. There is great thirst and the patients drink very large amounts of water to make up for the constant loss. The loss of fluid sometimes induces a condition of dryness of the skin and mucous membranes with diminished glandular secretion. Palpitation of the heart, neuralgia, and headache may occasionally be present, and vaso-motor disturbances, such as flushing of the face. When the disease has lasted a long time the general nutrition is apt to suffer and the bodily resistance is lowered. In many cases, however, the appetite is good and the general health does not seem to be affected. While occasionally a case may recover spontaneously, the disease is usually chronic, lasting many years, and death finally ensues from some intercurrent disease. The diagnosis is made by noting the continual passing of very large quantities of pale urine with low specific gravity, but without grape sugar, albumin or casts of any kind. Excessive thirst is likewise always present.

Treatment.— The best results will be attained by hygienic measures. The diet must be carefully regulated, only easily digestible articles being allowed. The ingestion of fluids may be moderately restricted. Warm clothing with a free, out-of-door life and a pleasurable amount of exercise are valuable hygienic agencies. Drugs have little effect upon the course of the disease. The following have been recommended: atropin or belladonna, antipyrin, the various bromids, ergot, and arsenic.

Renal Calculi.

Uric acid infarctions often are found in newly-born infants. They consist usually of uric acid or urates deposited in the straight tubes. The calices and pelvis of the kidneys may at the same time contain small masses of uric acid or the urates or ammonium and sodium. These concretions should disappear by the end of the first or second week. They are caused by the abundant excretion of uric acid during the first days with an insufficient supply of water to hold the salts in solution. As noted in another section, the urine may be passed in drops leaving a dark red stain upon the napkin, or there may even be temporary anuria in this condition. A true renal lesion is not apt to follow. A free administration of water will generally induce a solution and washing out of these deposits. Small calculi sometimes persist in the pelvis of the kidney or they may be formed later by the deposition of uric acid or the urates. When the calculi are not dissolved they may be washed down into the ureter and produce the symptoms of true renal colic. There is then acute pain in the region of the kidney radiating downward, with possibly even retraction of the testicle on the affected side. Small amounts of urine are frequently passed which may be tinged with blood. In older children there may be vomiting and marked evidences of prostration. When the calculi reach the bladder the pain quickly ceases. Prolonged acts of screaming on the part of infants, otherwise unaccounted for, are doubtless often due to the passage of small crystals of uric acid through the ureter. The only way to be positive, however, is to examine the urine when voided for the presence of these crystals. Occasionally, but rarely, a good-sized calculus may become impacted in the uretha. Examination may be made for this condition in cases of anuria, and evidences of local discomfort will be a guide for the search. The irritation of pelvic calculi may sometimes induce a mild form of pyelitis. Where a large calculus becomes firmly wedged in the ureter it may produce a complete stoppage which will eventuate in hydronephrosis.

Treatment.— Young infants should be given water as a routine measure, from a teaspoonful at first to half an ounce later, several times daily, in order to keep the uric acid and urates in solution and flush out the kidneys and urinary tract. When the urine becomes scanty and high-colored the water may oe given even oftener, and one or two grains of citrate or acetate of potash added every three hours will form a good alkaline water. Older children must have their diet carefully regulated and fluids freely given. The indications for surgical interference are the same as in adults.

Hematuria.

The red blood-corpuscles may be present in the urine either from certain general disturbances of the body or from local causes in the genito-urinary tract. As an example of the first may be cited infectious diseases, such as variola, scarlet fever, or severe paludism; various blood diseases of obscure origin, such as hemophilia and purpura; scorbutus and large doses of irritating drugs, such as chlorate of potassium. Among local causes may be mentioned acute nephritis, new growths in the kidney or bladder, and calculi in the kidney, ureter, bladder, or urethra. Some help may be had in discovering the source of the bleeding by noting the condition of the urine as passed. If the blood is thoroughly mixed with the urine at this time, the source is apt to be in the kidney. Where the bladder is the seat of the hemmorhage, the blood is usually passed at the end of urination, while if the urethra is affected, the first urine passed contains the blood. Small amounts of blood in urine may give it a slightly reddish or smoky appearance, while large quantities may appear as clots. In any uncertain case the microscope must be depended on for the diagnosis.

Treatment.— This must be directed to the cause, but small doses of the fluid extract of ergot may be frequently given if the bleeding continues.

Hemoglobinuria.

Hemoglobin may be present in the urine with very few or no blood-cells. It is occasionally seen in the same infectious diseases that may produce hematuria; also from irritating drugs that are eliminated by the urinary organs as carbolic acid and chlorate of potassium. It is also rarely seen in an epidemic form, occurring in the newly-born, known as Winckel's disease. The diagnosis is made by the microscope which shows the blood pigment granules, but not the red cells themselves.

Functional Albuminuria.

(*Cyclic or Physiologic Albuminuria.*)

An occasional albuminuria, without casts or other evidences of kidney disease, may be noted in children. It is more apt to occur shortly before or during adolescence. The cyclic form is apt to exhibit itself in the urine passed during the day, while the patient is on his feet, but disappears during the night and early morning. This is explained by posture, as there is no albumin present when the patient is lying down, but appears after the erect posture is maintained. Cold bathing, overexercise, too large ingestion of protein food, and various forms of indigestion and malassimilation have all been advanced to explain transient albuminuria. There are usually no symptoms, and the patient may even show all the signs of apparently perfect health. There is frequently the same uncertainty and obscurity in this condition in childhood as in later life. The cases should be kept under observation and if albumin persists very long, even in small amounts, there is probably some lesion in the kidneys. The condition of the heart and the tension of the pulse must be watched, as beginning hypertrophy and constant high tension point to kidney trouble. While being observed, the diet should be carefully regulated, overfatigue prevented, and attention given to general hygiene rather than to measures directed to the kidneys.

Indicanuria.

Indican in minute traces may be found in normal urine, but the condition may be considered abnormal when a marked reaction is given to the test. It is usually seen in the various forms of intestinal indigestion and fermentation. The putrefaction of proteins under the action of various bacteria results in a substance known as indol from which the indican is derived. The condition is sometimes also noted in tuberculosis, empyema and various diseases accompanied by suppuration. The treatment is dietetic and directed against the various forms of intestinal disturbance that are accompanied by undue food decomposition within the intestine. The color scheme and test for indican are given in the section on Special Tests (p. 52).

Acetonuria and Diacetonuria.

Minute traces of acetone and diacetic acid may be found in normal urine. They may be increased in fevers and in any condition accompanied by undue protein decomposition. They have been found in cases of diabetes followed by coma.

Congestion of the Kidney.

As the kidneys functionate very actively in early life, various grades of hyperemia may be easily induced. The various infectious conditions, marked digestive disturbances, high fevers from any cause, irritating drugs, and exposure to cold may be accompanied by traces of albumin and tube casts in the urine. This does not necessarily mean that there is the beginning of an acute nephritis, as the condition may pass away with the subsidence of the cause of the irritation. If the latter persists too long, however, actual nephritis may ensue. In a previous section, evidence was shown that almost any marked bodily disturbance, especially in infancy, will often be accompanied by the presence of albumin and casts in the urine. This may be simply an evidence of irritation of the tubules accompanying a slight congestion. The urine may be scanty, but if there is nothing beyond congestion, even if extreme and followed by almost complete suppression, there will be a rapid improvement without leaving behind any appreciable lesion of the kidney. A congested kidney is apt to be somewhat enlarged as there is more blood in the vessels than normal, and if the condition has lasted for several days the cortex may be very red and have the gross appearance of cloudy swelling.

The treatment includes keeping the bowels free and giving plenty of pure water. The latter is especially important in conditions accompanied by a great loss of fluid when the toxins circulating in the different organs in concentrated form irritate the delicate cell structures of the kidney as of the other vital organs, and hence need dilution and washing out from the system. The skin must be kept warm and moist and hot fomentations over the kidneys sometimes appear to be good. A milk diet is best.

Chronic Congestion.

(Passive Hyperemia of the Kidney.)

Chronic lesions of the heart or lungs or any pressure effect that interferes with the general circulation, and thus with the kidney circulation, may result in chronic congestion. It occurs principally in older children. A long-continued impeded circulation through the kidney will be followed by enlargement of the organ caused by a distention of the vessels with blood. On section, a dark-red color is noted. The urine is passed in small amounts, with high specific gravity, and usually showing albumin and tube casts.

The treatment must be directed to the skin and bowels, with the use of various diuretics, all of which are noted in our consideration of the treatment of nephritis. The principal treatment must naturally be aimed at the original condition that results in keeping up the congestion.

Nephritis.

In attempting to classify the various forms of nephritis from the standpoint of morbid anatomy, the student at the bedside will be much confused. It is often impossible to diagnosticate the anatomical varieties of nephritis by either a study of the clinical symptoms or of the urine. The physician frequently cannot tell whether he is dealing with acute congestion, acute degeneration, or acute glomerulonephritis of a mild type. From the standpoint of treatment, it is not very important to attempt to sharply differentiate these various disturbances. Nephritis will be here considered only as acute or chronic, although the synonyms will show the lesions that may preponderate in each condition as far as the epithelial, interstitial or vascular tissues of the kidney are concerned.

Acute Nephritis.

(*Acute Parenchymatous Nephritis; Acute Exudative Nephritis; Acute Desquamative Nephritis; Acute Tubular Nephritis; Acute Glomerulonephritis; Acute Diffuse Nephritis; Acute Bright's Disease.*)

Definition.— An acute inflammation involving any or all (diffuse) of the histological structures of the kidney.

Etiology.— Acute nephritis commonly occurs as a secondary condition in the course of the specific infectious diseases. Scarlet fever and diphtheria most frequently induce nephritis, but variola, varicella, measles, meningitis, typhoid fever, and influenza may also be noted as not infrequent causes. Any severe disease, such as pneumonia or acute enteritis, may irritate the kidney to the point of inflammation in striving to eliminate noxious products. Thus the colon bacillus may be the irritating agent. Cases that are considered primary are doubtless usually due to some infection that is obscure as to its point of entrance. The kidney lesions may be started by the toxins generated by infectious bacteria or may be caused by the direct action of the organisms themselves, in which case the disease assumes a severe type. Exposure to cold and wet may cause nephritis, possibly by checking the action of the skin and thereby throwing extra work upon the kidneys, or possibly by lowering the vitality so that various bacteria will grow sufficiently to infect the body, as in tonsillitis. The continued ingestion of drugs irritating to the kidney, especially chlorate of potash or the carbolic acid series, may induce nephritis.

Pathology.— The kidneys are usually congested, soft and somewhat enlarged, the cortex being swollen and presenting the appearance of cloudy swelling. The pyramids generally appear congested. In other cases the kidney shows little apparent change to the naked eye. Under the microscope, changes may be noted in the epithelial, interstitial or vascular tissues. The various names have been given to the nephritis according to the tissue that is preponderatingly affected by the inflammation. When the glomerular lesions are most marked, it may be called glomerulonephritis; if the glandular, epithelial cells in the tubules are mostly affected, we have parenchymatous nephritis; if the stroma is principally affected, it is named interstitial nephritis. When all the anatomical structures of the kidney are markedly involved, it is called diffuse nephritis. The renal cells of the tubules, as seen under the microscope, show cloudy swelling, degeneration and sometimes desquamation. The tubules may be filled with casts. In the glomerular type, the cells covering the capillary tufts undergo swelling and proliferation. The cells making up the capsules of the Malpighian bodies may likewise undergo proliferation. There may be an infiltration of the stroma, with leukocytes and plasma cells and a production of new connective-tissue cells. The blood-vessels of the affected part are engorged, and there may be a proliferation of the cells of the capillaries.

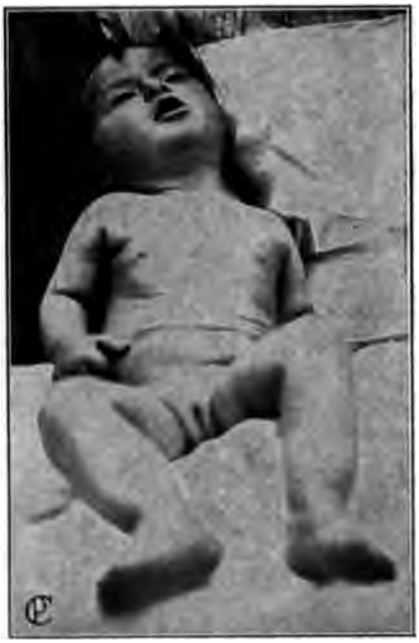

FIG. 131.— Puffiness of the face and edema of the extremities in a case of acute nephritis.

Symptomatology.—In early life, nephritis most frequently occurs as a secondary condition in the infectious diseases, especially in scarlet fever. It may come during the height of the primary disease or when the latter is subsiding. In scarlet fever it is more apt to ensue during the period of desquamation in the third and fourth week. The urine becomes scanty with a reddish-brown, smoky discoloration from the presence of red blood-cells or hemoglobin. Albuminuria is present, usually in marked degree; it may be so extreme as to change the urine into a solid on boiling. The urea is only partly excreted by the crippled kidneys, and hence accumulates in the blood. The amount of urea daily found in the urine is thus below normal. The specific gravity may be diminished, but when the urine is loaded with albumin it usually is as high or higher than in normal urine. Epithelial, granular and hyalin casts are usually found in abundance. Renal epithelial cells, red blood-corpuscles and leukocytes are also present. The temperature in nephritis is not apt to be very high, perhaps averaging from 101° to 102° F.; if it goes much higher — such as 104° to 105° F.— it shows a severe type of the disease. The nervous symptoms vary with the severity of the attack. In mild cases there may be only apathy or restlessness and slight headache; in severer cases there is worse headache, dimness of sight, stupor, coma, or convulsions. A high tension pulse usually precedes the symptoms of uremia. The graver nervous symptoms usually come in connection with scanty or suppressed urine and they disappear as the secretion becomes more abundant, with a lessening of the amount of blood, albumin and casts, and a freer elimination of urea. The cerebral symptoms may be caused by a general edema of the brain or by a compression of that organ by an effusion of serum within the ventricles. The principal gastroenteric symptom is vomiting, without much or any nausea, and occasionally diarrhea is seen in the uremic state. More or less dropsy, due to a transudation of serum caused by the altered condition of the blood, is one of the commonest symptoms of the disease. It usually begins as a slight anasarca of the feet and ankles from whence it may extend up the legs to the scrotum and finally to the trunk. An effusion of serum in and around the internal organs with grave results may take place in the following usual order of frequency — edema of the lungs, effusion into the pleural and peritoneal cavities, into the pericardial sac, into the brain, and finally into the loose connective tissue of the larynx producing that alarming and fatal condition, edema of the glottis. The anasarca is apt to precede these internal effusions but this is not invariably the case. It is evident that dropsy as a symptom may induce little or no discomfort to the patient or seriously threaten his life according to the part of the body affected. The types of nephritis seen in different infectious diseases show some difference as far as the symptom dropsy is concerned. Thus in scarlet fever there is early seen a puffiness under the eyes and a swelling of the limbs, while in diphtheria it is rare to see any anasarca, even with a severe nephritis.

The nephritis rarely seen in infants and young children, independently of the acute exanthemata, is sometimes called the primary form. This means only that the exact source of the agent that infects the kidneys is unknown. It may come from the tonsils or gastroenteric tract. Doubtless the colon bacillus is frequently responsible. The few cases reported in infancy have usually shown an abrupt onset, high fever, vomiting, and sometimes diarrhea and a high mortality. In older children, the onset and course are less severe and the prognosis better. Dropsy is reported as uncommon in both varieties in so-called primary nephritis.

The average duration of acute nephritis is from one to three weeks. The improvement in symptoms, and clearing up of the urine is gradual. Nephritis is usually accompanied and followed by marked pallor and anemia. While there is always diminution in the amount of urine, complete suppression is comparatively rare. The latter may exist for many consecutive hours and yet be followed by recovery. An examination of the bladder must always be made to be sure that retention is not interpreted to mean suppression.

Complications.— The most frequent complications are referable to the heart and lungs — in the former, endocarditis and pericarditis; in the latter, pneumonia and pleurisy. In rare instances meningitis may supervene.

Diagnosis.— The recognition of the disease must rest principally on careful examinations of the urine. It may be suspected when moderate fever and pallor exist without apparent cause.

Prognosis.— The younger the child, the worse the prognosis. After three or four years of age the prospect of recovery is good, especially if a fair amount of urine is passed and there are no marked evidences of uremia. If, however, there is a large number of casts present with a tendency to suppression, the outlook is graver. The mere amount of albumin passed is not of so much prognostic value. While a majority of the cases undergo complete recovery, there is always the possibility of chronic nephritis supervening. This must be borne in mind in giving the ultimate prognosis and the urine should be examined at intervals for a long time so that such a condition may be early recognized. Children may have a subacute or chronic nephritis with very few symptoms, and hence the condition may be overlooked during a long period of apparent health, or until an acute exacerbation brings on a serious or fatal result.

Treatment.— Children suffering from infectious diseases, especially scarlet fever, should be handled carefully as far as the organs of elimination are concerned — particularly the bowels and the skin. In this way the kidneys will be saved some of the irritation induced by the effort to eliminate the toxins produced by the original disease. Rest in bed, keeping the skin warm, and the use of mild saline laxatives, with milk and farinaceous foods will usually be sufficient for this purpose. When nephritis supervenes, in spite of such care, more active measures must be employed.

These resolve themselves into a freer use of cathartics, diuretics and diaphoretics, with a fluid, unstimulating diet. The action of cathartics is usually more certain than other agencies. Calomel in doses of one or two grains is a good cathartic and diuretic as well. Citrate of magnesia, a few ounces at a dose, and compound jalap powder, ten grains to a child of five years, given every few hours, will prove helpful in relieving the kidneys through the bowels. Unstimulating diuretics, such as the citrate and acetate of potash, from two to five grains every two or three hours, are valuable remedies. A teaspoonful of cream of tartar to a glass of water, drunk freely from time to time, is a pleasant diuretic. Plain water, given freely, is one of the most constant and valuable diuretics we possess. It should always be frequently given in cases of illness of all kinds in children to insure a free action of the kidneys. The alkaline effervescing waters, such as vichy, will sometimes be taken in preference to plain water. Most of the diuretic remedies have diaphoretic effect when the skin is kept warm, while if the surface is cool the latter is lost and the result will be exclusively diuretic. In urgent cases, the muriate of pilocarpin will often have a most beneficial effect in producing free sweating and hence in relieving the engorged kidneys. To a child of three years, gr. 1/60 or even 1/50 of a grain may be given every five or six hours until results are obtained. It may be given hypodermatically if a quick effect is desired, but, as it is depressing, stimulants must be given at the same time. The infusion of digitalis has a diuretic as well as stimulating effect, but it sometimes tends to upset the stomach.

The hot pack affords one of the most convenient and efficient methods of acting on the skin. A blanket is soaked in hot water (110° to 115° F.) wrung out and packed around the patient's body. Hot water bottles are put in position and the whole is surrounded by a dry blanket. The skin is soon bathed in a profuse perspiration, and this may be repeated several times in the day if necessary. Hot saline injections (105° F.) given with a fountain syringe and soft catheter, or a double current tube, have a very beneficial effect in favoring kidney action. One or two quarts may be thus employed several times a day. During convalescence, some preparation of iron, preferably Basham's mixture, should be given for the anemia that always ensues. The diet all through the disease must consist principally of milk given freely. Some of the variations of milk often do better than whole milk. Thus skim milk, buttermilk, milk and vichy, kumyss, junket, and whey may be tried. The various farinaceous foods mixed with milk are also desirable as nourishment. It is important not to push the liquid diet unduly.

Chronic Nephritis.

(*Chronic Diffuse Nephritis; Chronic Parenchymatous Nephritis; Large White Kidney; Amyloid or Waxy Kidney; Chronic Interstitial Nephritis.*)

Definition.— A chronic inflammation involving any or all of the histological structures of the kidney, but usually either prevailingly parenchymatous or interstitial, especially the former.

Etiology.— It usually occurs as a sequel to one of the acute infections, but with especial frequency after scarlet fever. The interstitial variety is usually seen in older children in connection with hereditary syphilis. Valvular disease of the heart, alcoholism, and chronic tuberculosis may also be noted as causes. Prolonged suppuration, especially of bones or joints, is usually responsible for the waxy form.

Pathology.— In the parenchymatous form, sometimes known as the large, white kidney, the organ is generally enlarged, with a yellowish-white appearance on section. The renal epithelial cells present a swollen, granular, or fatty appearance. The tubules may be contracted or dilated, and are usually filled with casts. There is compression of the tufts in the glomeruli from proliferation of the cells of the capsule and increase of connective tissue. The waxy kidney is usually much enlarged and presents the mahogany-brown discoloration with iodin. This form of degeneration is marked in the capillaries of the tufts and in the smaller arteries of the kidney. In the interstitial form, the kidney is small, with adherent capsule and nodular surface. The new connective tissue is distributed through the kidney in an irregular manner, producing a twisting or atrophy or dilatation of the tubules, the latter sometimes forming cysts. The glomeruli may likewise be enlarged or atrophied into little fibrous specks. There is thinning of the cortex after the chronic interstitial change has become marked.

Symptomatology.— The symptoms and course of chronic nephritis in the child do not differ in any essential way from the clinical manifestations seen in the adult, especially as the disease is usually found in later childhood. In mild cases, there may be only general weariness, occasional vomiting and digestive disturbances, headache, and anemia. In severer cases, dropsy is a very constant symptom. The edema may be limited to the lower extremities and the vulva or scrotum, or there may likewise be effusion into the interior cavities, more often into the peritoneal cavity and occasionally into the pleura and pericardium. The dropsy is variable, sometimes being excessive and then suddenly clearing up for a time. Albumin is pretty constantly present in the urine, with hyalin, granular, and fatty casts. These abnormal ingredients vary in amount with the increase or decrease in the severity of the disease. The daily quantity of urine passed likewise varies from much below normal to about the proper amount. The progress of the disease is usually slow and very irregular, perhaps continuing for a number of years with occasional exacerbations when the symptoms become urgent, followed by periods of remission when the patient is comfortable. Eventually, death takes place from uremia or some intercurrent disease. In the chronic interstitial form, edema is rare, but there is the usual high tension pulse and enlargement of the left ventricle. As in adults, the nervous disturbances preponderate, such as headache, neuralgia, spasmodic dyspnea, poor vision, and dyspeptic troubles. The urine is passed, having a low specific gravity and frequently without albumin. Casts are not nearly so abundant as in the other and more common form of chronic nephritis.

Complications.— Edema of the lungs and pneumonia may be considered the most frequent complications. One may also look for pleurisy or endo- or pericarditis.

Diagnosis.— The most objective symptoms leading to a recognition of this condition are a marked lessening in the quantity of urine passed and some form of dropsy. Poor nutrition, pallor, headache, high arterial tension and an enlarged heart should lead to careful examinations of the urine upon which the diagnosis must ultimately rest.

Prognosis.— Complete recovery is rare. The symptoms, however, may rest in abeyance for long intervals of time. The disease may last for three or four years and the patient eventually succumb to some intercurrent trouble. The immediate prognosis becomes bad in the presence of very scanty urine and extensive dropsy.

Treatment.— The management of the case must be largely hygienic and dietetic. The skin must be kept warm by flannels and, if possible, the patient sent to a warm, dry climate. Sudden changes, with marked lowering of the temperature, are liable to be dangerous. If dropsy is present the cathartics, diuretics, and diaphoretics used in acute nephritis may be employed. The same is true of uremic symptoms. General tonics, and especially iron, may be constantly given. While a fluid diet, principally milk, is the mainstay, it is sometimes necessary to allow a more generous diet, especially when anemia is extreme. The farinaceous foods can always be given, and it is sometimes an advantage to give meat in moderation. If weakness is great, the diet should be varied and more generous.

Pyelitis.

Definition.— An inflammation of the lining membrane of the pelvis of the kidney, often associated with nephritis or cystitis.

Etiology.— Most cases of acute pyelitis in infancy are due to infection by the common colon bacillus. The disease occurs oftenest in females and the colon bacilli discharged with the stools ascend to the pelvis of the kidney by the vagina, urethra, bladder and ureters. It is possible that a certain number of the cases result from a hematogenous infection. Such infectious diseases as typhoid fever, scarlet fever and diphtheria may cause pyelitis. Congenital malformations of the kidney or ureter, tuberculosis of the kidney, and renal calculi may act as causes. There may be a direct extension of inflammation from neighboring structures, such as the kidney or bladder. Finally, general pyemia may be responsible for the disease.

Pathology.— The pyelitis accompanying a general infection usually attacks both kidneys, while a purely local irritation involves only one side. The inflammation involves the mucous membrane of the pelvis and is of an acute inflammatory nature with congestion and infiltration of the cells and occasionally punctate hemorrhages. Pus is formed and passes out with the urine. It may quickly collect in such an amount as to distend the pelvis and calices of the kidney, thus leading to pyonephrosis. A pyelitis that persists is accompanied by more or less nephritis. The colon bacillus is found best in a catheterized specimen.

Symptomatology.— These are somewhat irregular in character. Pain may be a prominent symptom, especially noted during urination. In other cases there is no evidence of local discomfort and not much besides pyuria to indicate the disease. A moderate, continuous fever may be present or, perhaps more often, the temperature assumes an intermittent character and may be accompanied by chills and sweating. In all cases of unexplained fever in early life with cachexia, this disease may be suspected and the urine carefully examined. The urine is turbid, with an acid reaction, and contains blood- and pus-cells and epithelial cells desquamated from the pelvis of the kidney. Albumin is present, sometimes from the pus and at other times as an evidence of accompanying nephritis, when epithelial, granular, or hyalin casts are also found. The urine is usually swarming with bacteria. If the pyelitis is of tuberculous origin, tubercle bacilli will be present in the urine. Occasionally large quantities of pus will be discharged into the urine from an abscess rupturing into the pelvis of the kidney. If the disease becomes chronic, puria may be the only constant symptom to be noted. There are also apt to be evidences of failure of health and emaciation in these cases. An examination of the blood in pyelitis usually reveals a leukocytosis.

Diagnosis.— This rests finally on an examination of the urine, which when acid and containing pus and pelvic epithelium, will make the diagnosis positive. Cystitis is rare in children, but examination for urethritis in the male and vulvovaginitis in the female must be made when pus is found in the urine. The acid reaction, however, indicates pyelitis. Pain in the region of the kidneys, irregular fever with chills and scanty urine point to pyelitis, but pyuria is the only constant and positive symptom.

Prognosis.— The prognosis is good when the kidney proper has not become much much involved in the inflammation. Where there is extensive nephritis from calculi or pyonephrosis ensues, the prognosis is bad.

Treatment.— A free administration of water to which citrate or acetate of potash has been added will serve to flush out the kidney and check the acidity of the urine. Two to five grains of these alkalies may be given every three hours. Hexamethelamin, in doses of two to five grains, three times a day, to a three-year-old child, is an efficient urinary antiseptic. The alkalies and the urinary antiseptic should not be given at the same time, as the latter acts only in an acid medium. If calculi are present and can be located, surgical treatment may give relief. The same may be true of pyonephrosis. See page 82 for vaccine treatment.

Tumors of the Kidney.

Very rarely there may be tuberculous growths in the kidney, usually in connection with a tuberculous infiltration of other portions of the genitourinary tract. The vast majority of cases in which a malignant growth attacks the kidney in the child are of a sarcomatous nature. The sarcomata are primary growths in these cases and may be followed by secondary growths in other organs, such as the lungs or liver. The growth may start in the pelvis of the kidney or in the adrenals or cortex. The increase in size is rapid and may produce pressure effects on the various abdominal viscera, with ascites and rarely general peritonitis. Generally only one kidney is involved.

Symptomatology.— The tumor is usually the first symptom to be noted. It steadily grows until a very great size is reached. The growth may usually be first noted in the side of the abdomen, but soon pushes forward to the middle, and in a few months may fill the whole cavity. Hematuria is sometimes present, and there is a rapid failure of strength and vitality. There will be pressure symptoms according to the size and direction of the growth. The patients rarely live beyond a year, and frequently not so long unless an operation is successful.

Diagnosis.— The diagnosis is made by the rapid growth of a solid abdominal tumor in an infant or a young child. Practically all tumors of this nature at this time and in this position are sarcomata.

Treatment.— The tumor must be removed as soon as recognized. While the mortality is high, a certain number of recoveries have been reported. See page 530.

Hydronephrosis.

Hydronephrosis is a dilatation of the pelvis and calices of the kidney, often associated with necrosis of the kidney parenchyma, due to some obstruction to the outflow of the urine. It is seen more frequently in early than late childhood and about half the cases are found to be congenital.

The obstruction may be situated anywhere in the genitourinary tract from the external meatus to the calyx of the kidney. The following causes may be noted: Imperforate prepuce or meatus; congenital stricture of the urethra; congenital hypertrophy of the bladder wall inducing stenosis of the ureters; misplacement of the ureters; valve-like strictures in the course of the ureter or of the ostium pelvicum, showing a reduplication of the mucosa and of the muscularis from inflammatory change or abnormalities of development; urinary calculi occurring after birth and, by their growth, occluding the urinary tract; pressure by abnormal growths in neighboring organs or mechanical pressure from a float-

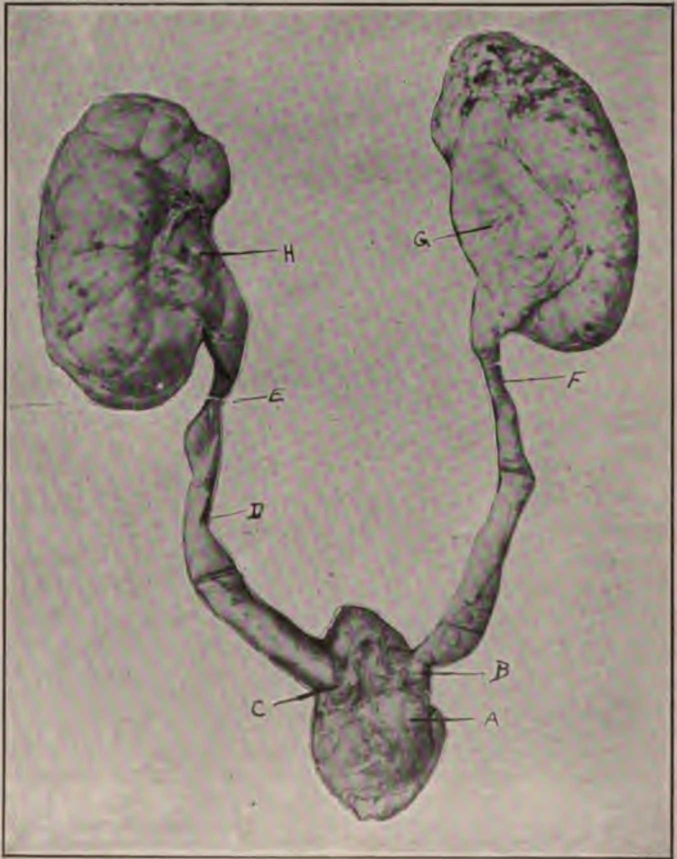

FIG. 132.— Bilateral congenital hydronephrosis, caused by valve-like strictures in the ureters. From an infant 26 days old.

ing kidney; deformities of the skeleton or any foreign body in connection with the genitourinary tract.

Hydronephrosis may be unilateral or bilateral, in the latter case the obstruction usually exists in the bladder or urethra. The congenital form may be either unilateral or bilateral, but is usually unilateral. There will be extensive dilatation if the obstruction in the urinary tract occurs before the fourth month of intrauterine life, as the secretion of urine begins about this time. When the hydronephrosis is unilateral, the other kidney will functionate vicariously. In some cases the obstruction may be only temporary or partial, when the affected kidney will retain part of its function.

Cases of hydronephrosis of both kidneys are fatal during infancy, and the condition is usually overlooked, the babies dying of some intercurrent affection. In older children, with the unilateral form, the disease may be suspected or recognized when the dilatation is sufficient to produce a tumor in the lumbar region. Nephrectomy may then afford a radical cure if the other kidney is sound. Where hydronephrosis is due to an impacted calculus in a ureter, the condition is apt to eventuate in pyelonephritis.

Enuresis.

(*Incontinence of Urine.*)

The symptom-complex of incontinence of urine can best be studied by considering, first, the phenomena which accompany the voiding of urine under the action of the bladder reflexes, and, second, the anatomical and physiological peculiarities accompanying this function in early life.

The bladder, the spinal centers innervating it, and the brain holding an inhibition over the spinal centers, all have a part in this action. The following diagram, modified from Gowers, will give a suggestive idea of these parts:

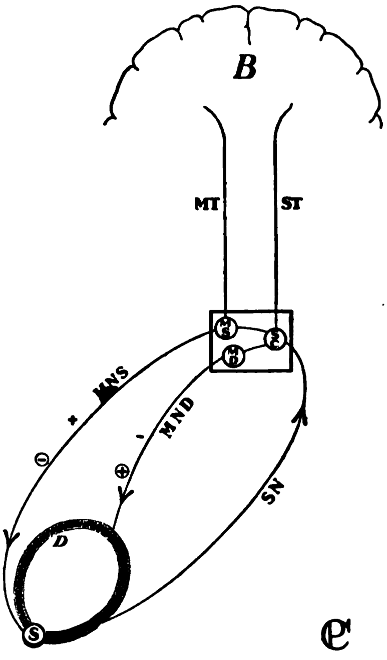

FIG. 133.

In the bladder we have the sphincter (S), guarding the outlet by its tonic contraction, and the detrusor (D), or muscle of the bladder, usually distended, but which, by its contraction, empties the organ. Both sphincter and detrusor are innervated by the segments in the spinal cord corresponding to the third, fourth, and fifth sacral nerves. The motor tonic centers for the sphincter (MS) keep this muscle in contraction, while the centers for the detrusor (MD) hold it in a state of dilatation corresponding to a positive and negative, or plus and minus action, of the motor nerves MNS and MND. As the bladder becomes distended with urine, sensory impulses are transmitted by sensory nerves (SN) to the sensory centers of the cord (SC) which are connected with the motor reflex centers (MS and MD) by association fibers. When the motor centers are sufficiently irritated they reverse their action, as a negative impulse (—) is sent down by the motor nerves MNS to the sphincter, which dilates, and a positive (+) action is transmitted by the motor nerves MND to the detrusor which promptly contracts.

The action of a physiological, automatic reflex is thus shown. This action, however, is held in check by the inhibition of the brain (B) that holds a restraining influence on the spinal reflexes by nerve fibers connecting with them (MT and ST). It is usually necessary to relax the inhibition of the brain before the automatic reflex can take place. Urination is, therefore, not so much a direct voluntary action as an indirect action of the brain in relaxing its hold on the spinal centers and thus allowing the automatic reflex full sway.

In early life there are certain anatomical and physiological peculiarities that render the bladder and its reflexes very unstable. While the sphincter is weak, the detrusor is thick and powerful. In making autopsies on female infants the bladder, owing to the thickness of its wall, is sometimes mistaken for the uterus. A powerful detrusor acting against a feeble sphincter thus renders the action of the bladder in retaining the urine unstable. In early life the spinal reflexes are also very active. The motor areas of the cord are relatively more developed than the sensory part, and hence motor actions preponderate. What would cause a sensory disturbance in an adult is reflected into a motor arc in the child and hence produces a motor disturbance. This is exemplified in the beginning of severe illness, especially in acute infections, where the chill (sensory disturbance) of the adult is often replaced by a convulsion (motor disturbance) in the child. This activity of the motor reflexes exhibits many forms in early life, especially in infancy, when the action of the spinal cord is most active, and the brain being as yet undeveloped fails to hold a proper inhibition on these lower centers. The watery brain of the infant, with relatively little gray matter, cannot hold the active reflexes of the spinal centers in proper equilibrium.

There are two forms of incontinence — active and passive: (a) Active incontinence is produced when sufficient urine is present in the bladder to cause enough irritation of the sensory nerves to induce a contraction of the detrusor and dilation of the sphincter through the spinal centers. There is no paralysis, but either a lack of proper brain control or overaction in the cord. In this form the urine usually passes rapidly and in full stream.

(b) Passive incontinence is caused by weakness or paralysis of the sphincter, and the urine usually dribbles away without ability of control.

With the constant underlying predisposition to incontinence in early life, there are certain specific causes that may be mentioned in order to throw light on treatment: (1) *Excessive acidity of the urine.* Uric acid is readily formed in early life; in new-born infants crystals are often seen in the calices of the kidney. The urine may thus become so irritable as to be passed drop by drop, or with a reddish tinge that simulates the appearance of blood on the diaper. Other acids, such as the acid phosphate of sodium and lactic and hippuric acids, may be present in excess in the urine. Very small quantities of overacid urine often provoke incontinence by irritating the bladder, and thus stimulating the nerve reflexes to act. (2) *Excessive irritability of the muscular coat of the bladder even when the urine is mildly acid or neutral.* As the detrusor has an exaggerated contractile power in these cases, the urine is passed in a full and rapid stream. Even ordinary stimulation often causes strong contraction in the unstriped muscular fibers. This explains why atropin or belladonna acts almost as a specific when the muscle is thus at fault. (3) *Weakness of the sphincter.* This form occurs in feeble children who are in poor condition from severe illness or underfeeding, or where the innervation of the sphincter has been weakened by disease of the spine or spinal nerves. The urine is not passed rapidly nor in full stream, but is more apt to dribble away. (4) *Reflex irritation from disturbances outside the bladder.* The genitals, anal ring or rectum may present conditions producing sufficient irritation to cause frequent contractions of the bladder under reflex action. Phimosis, adhesions of prepuce to glans with retained smegma, stricture of the urethra, balanitis, vulvitis, ascarides, fissure of the anus and hard scybala in the rectum may be noted in this connection. (5) *Neurotic causes.* Children with unstable nervous equilibrium from chorea, epilepsy, and similar conditions are prone to incontinence of urine. Under psychical influence, especially in dreams, the child imagines a convenient place for urination and the reflexes act. (6) *Vesical calculus* may be a rare cause of incontinence, and, when acting, will be both diurnal and nocturnal, with urine turbid from mucopus and frequent painful micturition. (7) *Malformation of the bladder.* Congenital deformities, such as extroversion of the bladder, rectovesical and vesicovaginal fistulæ, and a few cases reported where ureters have emptied directly into the urethra, will be accompanied by constant dribbling of the urine.

Treatment.— It is evident from an enumeration of the different causes that one kind of treatment will not be adapted to all cases, and hence the physician must find, if possible, the principal reason for incontinence by an examination of the urine, together with a general and local physical examination of the patient. More than one cause will often be found present. Highly acid, scanty urine may be relieved by a free administration of water together with an alkali, such as the acetate or bicarbonate of potash, five grains of either thrice daily. Where overirritability of the detrusor is the principal cause, belladonna in full physiological dose, by its action on unstriped muscular fiber, will usually diminish functional activity and thus correct the condition. For a child of five years, grain 1/400 atropin sulphate or the tincture of belladonna, ♏ v, may be given late in the day, and the dose increased until there is dryness of the throat and flushing of the skin. If the incontinence is not relieved when the drug is pushed to its full effect, it will not be necessary to continue it very long. Where there is evidence of weakness of the sphincter, nux vomica or strychnin and ergot will act in strengthening its tonicity and stimulating the nerve centers. From 5 to 10 minims of fluid extract of ergot and 5 minims of the tincture of nux vomica may be given thrice daily, well diluted in water, to a child of five years. Unlike belladonna, these remedies may have to be continued for several weeks before the full benefit is obtained. Occasionally good results will be obtained by a few hypodermatic injections of ten drops of the fluid extract of ergot directly into the ischiorectal fossa. Suppositories, containing half a grain of ergotin, may also do good in this class of cases. Incontinence of feces may have the same nervous causes and mechanism as incontinence of urine and may require the same treatment.

The general hygienic treatment is always important. A simple, unstimulating diet, with a light, dry supper is desirable. Restriction in the amount of fluids, especially late in the day, may be tried. Postural treatment at night, with the buttocks elevated to save the neck of the bladder, has been advised, but is impracticable. General tonic treatment, such as the use of large doses of the syrup of the iodid of iron, will relieve certain cases. Cold bathing, and plenty of fresh air will act as adjuvants. The children should be taken up late at night and early in the morning, and placed upon a commode to prevent the bladder from getting too full. Punishing these children is unavailing and usually makes the matter worse by upsetting the nervous system. The trouble is apt to be more frequent and intractable in boys than in girls, and in rare cases may last for years. An intelligent study of the child's condition and a recognition of the principal cause in each case and an adaptation of the treatment to such specific cause will, however, usually bring relief.

SECTION XII.

DISEASES OF THE GENITAL ORGANS AND BLADDER.

CHAPTER XXXII.

DISEASES OF THE GENITAL ORGANS.

Phimosis and Paraphimosis.

Phimosis exists when the prepuce is so narrowed or contracted that the foreskin cannot be freely drawn back over the glans.

Hofmokl notes four causes of phimosis:

(1) A prepuce congenitally too long and too narrow (hypertrophic form), (2) congenital narrowness restricted to the external opening of the prepuce, (3) long persistence of extensive epithelial agglutination between glans and prepuce, (4) congenital and abnormal shortness of the frenulum and its location too far toward the front.

Symptomatology.— Urination is frequent and painful. When about to urinate the child is very restless, and while voiding will often cry out with pain. Older children attempt to restrain the act as long as possible. In some cases the prepuce balloons out with urine as it passes or it may escape drop by drop. If the foreskin is very tight, drops of urine remain and decomposition of this retained urine often produces an eczema at the meatus or even on the thighs and over the entire genital region. Such inflammatory processes may cause balanitis. The habit of masturbating may be induced by the irritation. Following such a course, an infection may occur which may ascend through the urethra, sometimes, although rarely, causing urethritis and cystitis. Dilatation of the bladder and hydronephrosis may also result in neglected cases. Syncope and epileptiform convulsions were formerly erroneously attributed to phimosis.

If the foreskin be forcibly retracted over the glans, the pressure of the preputial ring in the coronary sulcus may cause strangulation. Such a condition is known as paraphimosis and soon causes violent pain. If this obstruction to the circulation is not relieved, edema and inflammation will occur, which later can produce ulceration and necrosis of the parts.

Treatment.— The treatment of phimosis with adhesions consists in gently separating the agglutinated surfaces with a blunt probe and then retracting carefully the foreskin over the glans. If this is not easily accomplished the foreskin may be stretched by slowly separating the blades of a forceps until it is possible. Any smegma which is present is wiped away. If urine is retained in the foreskin, causing decomposition, circumcision is indicated rather than stretching. To relieve a paraphimosis, replace the glans within the prepuce by using the first and second fingers of both hands from below and with the thumbs above, forcing the glans through the constriction. If this cannot be accomplished by manipulation, the strangulating ring must be incised and cold compresses applied to reduce the swelling and inflammation. As a rule, circumcision is performed at a later date.

Balanitis.

This condition is usually due to an accumulation of smegma and retained urine, the decomposition of which causes an inflammation of the prepuce. Such accumulations occur most frequently where there is phimosis. Other causes of balanitis are masturbation, injury, and infection of the mucous membrane of these parts. There is redness and swelling of the free margin of the prepuce, the opening of which is often covered by small crusts. Several drops of seropus may appear if the opening of the prepuce is separated; it is usually impossible to retract the prepuce entirely.

Treatment.— Distend the prepuce by injecting an antiseptic solution, such as bichlorid of mercury, 1 to 5,000, or a weak permanganate of potash solution, three or four times a day. When this cannot be accomplished, apply the antiseptic dressing ice-cold. A solution of bichlorid of mercury 1 to 10,000 or liquor alumini acetatis N. F., one to four parts, is suitable. The wet dressings are applied until the swelling is reduced. Slitting up the prepuce to permit of thorough cleansing is sometimes necessary and then gives the quickest relief. All adhesions should be removed when this is done. Circumcision at this time should not be performed.

Urethritis.

Urethritis may be simple or specific. In the former, lack of cleanliness, injury or the passage of uric acid crystals are the usual causes. There is pain on urination and a slight discharge of pus. The inflammation is usually confined to the anterior portions of the urethra. There are no sequelæ as in the specific form.

Infection causing specific urethritis takes place by direct contact and can be diagnosticated only by a bacteriological examination. Gonocci are generally found in great numbers in the discharge. Except for the constitutional symptoms, which are mild or entirely absent, specific urethritis gives the same clinical picture as in adults: that is, a thick purulent discharge and burning pain on urination. Complications are rare; those likely to arise are stricture, posterior urethritis, epididymitis, arthritis, and gonorrheal conjunctivitis.

Treatment.— Hexamethelamin in 5-grain doses three times a day with rest in bed is usually sufficient, but in some obstinate cases it is necessary to irrigate the urethra with argyrol in a 5 per cent. solution or potassium permanganate in ½ per cent. solution twice daily. The pelvis should be covered to avoid carrying the infection to the eyes and the attendants warned of such danger.

Vulvovaginitis.

(*Urogenital Blennorrhea.*)

This condition is a frequent cause of dysuria in girls, and may occur under the influence of general malnutrition, as in marked anemic conditions, uncleanliness, masturbation, when parasites are present, or following an infectious disease. The usual cause, however, is an infection by Neisser's gonococcus.

In this specific form infection takes place by either direct sexual contact or by handling, contact with the infected bed linen of parents, and less frequently from towels or discarded dressings. Epidemics of vaginitis frequently occur in hospitals and especially in institutions for children. Differentiation of the simple and gonorrheal types is based on the bacteriological examination of the pus.

Vulvovaginitis begins with redness and swelling of the parts and a discharge of pus, which is usually yellowish or white in the simple form and greenish in the gonorrheal. The pus is abundant, and on drying forms crusts, causing the labia to adhere. Micturition is frequent and painful, due to contact of the urine with excoriations of the mucous membranes of the urethra and the labia. There is also pain on locomotion, due to the excoriated thighs. In severe cases pus may be seen oozing from the cervix. The vaginal mucous membrane bleeds easily, due to the excoriations present. Constitutional symptoms are infrequent, but buboes occasionally occur and may even suppurate. In the gonorrheal form the usual adult complications may occur, such as arthritis of the large joints, conjunctivitis, and cystitis. Salpingitis and general peritonitis have occurred in our service. On the other hand, the symptoms may be so mild as to cause no disturbance, and are only diagnosticated as specific in the laboratory. This type is more apt to be seen in institutions than in private practice.

Treatment.— Treatment of all vaginitis cases requires isolation of the case and scrupulous cleanliness as regards the patient, the linen, and the dressings as well as the attendant's hands. In severe cases the patient should be in bed. In the simple form, after removing the cause, irrigate the parts two or three times daily with warm normal salt or boric acid solutions, bichlorid of mercury 1 in 10,000, or formalin solution 1 in 5,000. Cover the thighs and vulva with unguentum zinci oxidi or stearatis. A sterile pad is applied over the parts.

In gonorrheal cases this treatment may be supplemented by the use of vaginal suppositories of argyrol 10 per cent. in oleum theobromatis; insert one after each irrigation. In all cases general tonics are indicated.

In simple cases under treatment the course of the disease is about two or three weeks. The gonorrheal form lasts much longer, often for months, and relapses are frequent. Some seem to assume for a time a latent form, which is apt to become active when the resistance is lowered from intercurrent disease.

Vaccine Treatment.— The vaccine treatment may be tried in intractable cases or for a series of cases in an institution. A dose too large or too small gives little or no response, five million dead bacteria being the preferred initial dose. Under this treatment clinical evidences of gonorrhea disappear in ten to twenty-one days, and no gonococci can be found in the smears for some time.

In some cases a polyvalent vaccine seems more efficient than a univalent one. The best results are obtained when the vaccine used is obtained from the patient's own organisms, except where the case is of long duration or has been treated by antiseptics, as these lower the virulency of the organism ; it is then better to make vaccine from a strain of known high virulence. Experiments have proved this step to be most efficient in spite of Torrey's conclusion that "the family gonococcus is heterogeneous."

If an eye should become infected, the injections should be given at once, using temporarily a stock vaccine (see p. 78).

As a rule, the discharge increases for the first two or three days after the injection, and then diminishes quite rapidly. However, the vaccine treatment is many times unsuccessful, and a case should not be considered cured until a long period of quiescence has elapsed without recovery of the organisms.

Masturbation.

In infants and very young children the presence of some organic source of irritation in or about the genitalia is assumed as the cause of masturbation. Of such irritations itching, vulvar eczemas, and pin worms which have escaped from the rectum and found their way into the vagina are the most frequent causes in girls. Attempts to relieve this irritation by scratching or rubbing the thighs together results in the persistence of the habit because of the sensations it produces. In boys, an elongated prepuce, friction from a phimosis, excoriations at the meatus from a highly acid urine, may be the original cause. In girls, adhesions about the clitoris from smegma and uncleanliness are common causes.

In older children the beginning of such a habit is more probably due to acquaintance with others with whom the practice is in vogue: in some cases, accidental discovery that genital irritation produces voluptous sensations occurs in certain sports, such as bicycle-riding or tree-climbing.

It is an error to assume that this practice produces nervous, irritable children, with pallor, headache, and sickly appearance and dark rings under the eyes unless masturbation be indulged in to excess. In children of the neurotic type such symptoms are, however, greatly aggravated by the violent sexual excitement so produced.

Treatment.— It is essential to remove the cause. By the use of suitable night gowns and bandages children can be prevented from masturbation at night. During the day constant supervision is desirable, but the early evening and early morning are critical times. Dietetic changes and psychic treatment after suitable explanation are potent factors in eradicating the habit. Effort should be made to keep the child occupied all the time, and frequent diversion of the mind toward active and healthy normal channels will prove most efficient measures. Cold affusions to the spine may be employed in intractable cases.

Hydrocele.

When the peritoneal sac surrounding the testicle and epididymis is distended with fluid, the condition is known as hydrocele. It is not uncommon, and is usually congenital in origin.

The following varieties may be differentiated:

HYDROCELE OF THE TUNICA VAGINALIS (with the funicular process obliterated).—This is one of the most common forms found in children. The tumor formed is oval and is firm and tense. It may occur on one or both sides. The tumor cannot be reduced. Fluctuation can usually be obtained, and the site of the testicle can be seen by illumination of the scrotum. The cord is felt above the rounded upper portion of the swelling, and the testis is generally situated posteriorly, projecting into the cavity, and is therefore not readily detected by manipulation.

CONGENITAL HYDROCELE exists when the funicular process is patent. The signs above stated exist except that upon manipulation the fluid can be returned to the abdominal cavity.

INFANTILE HYDROCELE occurs when the funicular process is closed at its upper extremity only. The fluid extends along the cord, and the tumor is therefore elongated; the other signs are the same as given above.

ENCYSTED HYDROCELE OF THE CORD is one in which there is an additional point of obliteration of the intraabdominal portions of the funicular process above the internal abdominal ring; fluid distending this portion of the canal forms a tumor resembling a cyst in addition to the tumors in the scrotum.

Treatment.— As a rule, no treatment is required. After several weeks the condition spontaneously disappears. If phimosis is present this should be corrected at once. In more resistant cases puncturing the sac and allowing the fluid to thoroughly drain off usually produces a cure. If relapses occur, instillating one or two drops of the tincture of iodin in ten drops of water will set up adhesions sufficient to obliterate the sac. In some of the congenital forms, a truss may be applied in order to obliterate the funicular process, and then if a cure is not affected aspiration is performed. If the hydrocele is associated with a hernia a suitable truss must be worn after the evacuation of the fluid.

Undescended Testicle.

(*Cryptorchidism.*)

When not in the scrotum, the testis may be found (1) in the abdominal cavity attached to the abdominal wall or (2) just inside the internal abdominal ring or (3), as is most common, in the inguinal canal or (4) just beyond it.

The causes of such a malformation may be a short or abnormally attached gubernaculum, a contracted external ring, or an abnormally large epididymis.

The diagnosis is made when the scrotum is found empty on the affected side, and a small movable tumor the size of a hazelnut is found in the inguinal region which gives the unpleasant testicular sensation on pressure.

If no symptoms arise the best treatment is neglect; if, however, there is much pain or tenderness, which sometimes occurs when the testicle is in the canal, surgical intervention is required. The surgeon may succeed in drawing the testicle down into the scrotum or he may be obliged to replace it in the abdomen.

If the testicle lies within the abdomen and develops there, its function is not interfered with. When it is subjected to constant pressure within the inguinal canal, such compression may hinder development or lead to atrophy.

Differential Diagnosis of Swellings in the Inguinal Region.

Swellings in the inguinal region are either fluctuating or non-fluctuating. If fluctuation be present the tumor may be an abscess or a hydrocele. If an abscess be probable, there may be a history of vulvovaginitis, urethritis, scabies, or other irritant lesions about the genitals, and the patient will have some degree of increased temperature and a leukocytosis. Caries of the vertebra may produce a psoas abscess. If hydrocele is suspected, the history may show that the tumor has persisted since birth or that there has been an injury. The temperature and the blood count will be normal, and the light test will be positive. On percussion of a hydrocele or an abscess the note is dull and not tympanitic as it may be in hernia. A hydrocele with patent funicular process may recede under moderate pressure, but no gurgling is felt as in the reduction of hernial contents.

In tumors without fluctuation, hernia, undescended testicle, or enlarged inguinal glands may be suspected.

If the condition be hernia, the percussion note is resonant; if reducible, the tumor disappears quickly and is accompanied by a gurgling sound; the external abdominal ring is patent and there is an impulse on crying or coughing; there is opacity when tested by transmitted light.

If the tumor is an undescended testicle, the corresponding side of the scrotum will be found empty; the tumor is dull on percussion, freely movable, and hard. On pressure, the characteristic testicular sensations can be elicited in older boys.

If the swelling is due to the presence of enlarged inguinal glands there will probably be an existing cause found in the genital region, such as eczema, vulvovaginitis, scabies, etc. Such tumors are dull on percussion, and hard and freely movable unless suppurating. In these cases the testicle will be found in its normal place. Enlarged glands are usually multiple.

Frequently hernia and hydrocele occur simultaneously, and in such cases the diagnosis is more difficult.

CHAPTER XXXIII.

DISEASES OF THE BLADDER.

Cystitis.

In infants, two forms are distinguishable, one presenting general symptoms, including restlessness, anorexia, fever, pallor, and debility, but without urinary symptoms; the other with the above general picture, but with symptoms showing urinary involvement, such as increased frequency of urination, pain or difficulty in voiding, abdominal colic, tenderness over the bladder, and redness about the meatus.

A frequent cause of cystitis is infection by the bacillus coli, either alone or in mixed infection, and such infections are termed colicystitis. Many other organisms are also found as the causative factor, but are of far less frequent occurrence.

In colicystitis, the urine shows the following characters: it is turbid, acid in reaction, and contains albumin (usually less than 15/100 per cent.) pus-cells and bacteria, a pure culture of bacillus coli being frequently obtainable. The acid reaction of the urine in cases of cystitis signifies infection by the bacillus coli or the bacillus tuberculosis: the latter is very rare as a primary infection, but does occur with general tuberculosis or when the kidneys or genitals are involved in tuberculous lesions.

When due to infection by the pyogenes, the reaction is alkaline. In cases of such origin, the symptomatology is much the same as in colicystitis, but the disease is more severe. In pyogenic infections blood is often found in the urine.

Treatment.— The remedy par excellence for cystitis is hexamethylenamin (urotropin); infants may be given two grains every four hours; older children 5 to 7½ grains every four hours. Salol in smaller doses is also useful, but not quite as effective. Chronic cases may require irrigation of the bladder: in such cases boric acid solution 1 per cent. or silver nitrate solution 1 in 5,000 are the best solutions to use.

In all cases give plenty of alkaline waters to drink, avoid salty foods and spices, and keep the patient in bed while the acute symptoms persist.

Vesical Spasm.

Spasm of the sphincter muscle of the bladder often occurs in young children due to a variety of causes; for example, dysentery, anal fissure, parasites, inflammations in the neighboring parts, as Pott's disease, and lesions in the rectum, pelvis, or perineum. Occasionally in older children a brief spasm occurs due to certain drugs, such as turpentine, or to sudden exposure or local chilling, as a cold closet. The usual cause of spasm of the sphincter is the irritant effect of a highly acid or concentrated urine on the bladder walls. The most prominent symptom is frequent micturition, each act often yielding but a few drops of urine. Pain is severe and is accompanied by marked vesical and rectal tenesmus, but no blood is present in the urine.

Treatment.— Treatment consists in the removal of the cause in conditions other than that due to the urine itself. When the spasm is due to the urine, the treatment consists in copious draughts of alkaline water and the administration of potassium acetate or citrate in doses of two to five grains with the tincture of belladonna or the tincture of hyoscyamus one to four drops every two or three hours.

Vesical Calculus.

The severest dysuria of the chronic type may be produced by a vesical calculus. This condition rarely occurs in children, while in infants it is still less frequent. A sudden stopping of the stream of urine is the most characteristic symptom, although diurnal incontinence is occasionally the evidence which may call to mind the possibility of the presence of a calculus. Pain on urination often occurs and is usually felt in the end of the penis or in the perineum. Rectal tenesmus with prolapse is frequently present, due to straining when calculi exist. On account of the genital irritation in this condition masturbation is often practised. Urinary changes differ from those in adults in that hematuria is rare, and pus and mucus are infrequent or occur in small quantities. A positive diagnosis is made when the stone is felt by bimanual rectal examination or by searching the bladder with a sound or wax-tipped catheter.

The treatment is surgical. Removal through suprapubic incision is usually necessary.

SECTION XIII.

DISEASES OF THE NERVOUS SYSTEM.

CHAPTER XXXIV.

GENERAL NERVOUS DISEASES.

General Consideration.

To the unstable equilibrium of the rapidly developing brain, to its peculiar sensitiveness to peripheral irritation, to the important rôle played by the infectious diseases, the liability of the child to traumatism, and finally to hereditary influences, singly or combined with any of the above, must be attributed the many neurotic disorders which are peculiar to early life.

A full and detailed history will be of great assistance in arriving at a diagnosis in this class of cases. A careful and complete physical examination should be made with the child entirely naked. Trained observation for details coupled with logical reasoning will be required for success in many instances. Certain cases, if once seen in life, are rarely mistaken, as, for example, cretinism; on the other hand, an unusual case of multiple neuritis may require a complete knowledge of the methods of examination, and the diagnosis will have to be supported by a differential diagnosis, consciously or unconsciously made by the physician. The sensory disturbances are elicited with difficulty in early life, and the muscle tone must be interpreted also from the view-point of the history of previous feeding.

The gait should be carefully observed, as some are quite characteristic of certain groups of cases, for example, the cross-legged progression, or scissors position, indicates a spastic paraplegia. The spastic gait is seen in cerebral palsies, while the ataxic gait is assumed by children suffering with cerebellar disease, neuritis, or the more rare disease, hereditary ataxia. The swinging gait of poliomyelitis is distinguishable from the waddling, swaying gait seen in those with the various dystrophies. As the cooperation of the patient is not always obtainable, and the mother's statements may be innocently misleading, tests should be made for blindness and hearing. A candle or bright-colored objects may be presented to the eyes as a test. Vision may be tested with the cards described on page 538. The finger will be allowed to touch the eyeball in absolute blindness, but if the corneal reflex is present there will be prompt closure. An ophthalmoscopic examination is feasible after proper preparation with atropin. Mummying the child as for intubation may be necessary with intractable children. It should be recollected that inequality of the pupils and even nystagmus may be congenital.

The hearing may be estimated by clapping the hands suddenly behind the child, by the use of a whistle, or the whispered voice. Where an intelligent response may be expected the tuning-fork can be used. Tickling or pinching the toes or fingers may be used as a test for actual paralysis. It should be remembered that both upper extremities are rarely paralyzed in children; that the patellar reflex may be obscured by fatty deposits, and that it should be relied upon only after obtaining the same result after repeated tests. Ankle clonus, however, is always indicative of an abnormal condition. The superficial reflexes are of little or no value in the early years. The Babinski reflex, extension of the big toe, is of no significance in the first year of life, being normal during this period.

When the electrical examination is made in children, great care should be employed not to frighten the patient; allowing them to play with the electrodes at first is a good plan. Use the mildest currents that will produce results, and compare the reaction to the opposite extremity. The behavior of the muscle in reacting is often sufficient to appreciate degenerative changes.

Paralysis in General.

Paralysis or the loss of motor power may be associated with sensory and reflex disturbances and with atrophy of muscle. The motor inability may be localized and result in a monoplegia, that is, a paralysis of one extremity, diplegia in which both sides are involved, paraplegia in which the two lower limbs are paralyzed, and hemiplegia or a paralysis of one-half of the body.

Again paralyses are spoken of as central when they are due to lesions of the brain. Spinal, when they originate in the cord; peripheral, when the result of nerve or muscle disease.

General Characteristics of the Various Types — Cerebral Paralysis (Spastic Paraplegia).— This is commonly unilateral, the lesion being on the opposite side of the cortex: the face is partially involved. Spasticity, increased reflexes, slight electrical changes and no atrophy of muscle distinguish this type.

Spinal Paralysis.— Flaccidity with wasting of muscle indicates involvement of the peripheral motor neuron. There is no disturbance of sensation (except in myelitis). The reflexes are absent or diminished, and the reaction of degeneration is present.

Nerve Paralysis.— The toxic forms are apt to be bilateral in distribution, the reflexes are lost and so also is muscle excitability. The traumatic paralyses are due to pressure on the nerves, as a result of fracture, dislocation, and pressure from without. They are local in distribution, and if there is response to electrical stimuli the nerve recovers its function.

Muscle Paralysis.— The motor inability is here due to the changes in the muscle fibers themselves. There is diminished electrical reaction and atrophy or pseudohypertrophy of muscle. Diseases of the joints, bones, and tendons may by atrophy and disease produce a paralytic condition, as in rheumatoid arthritis.

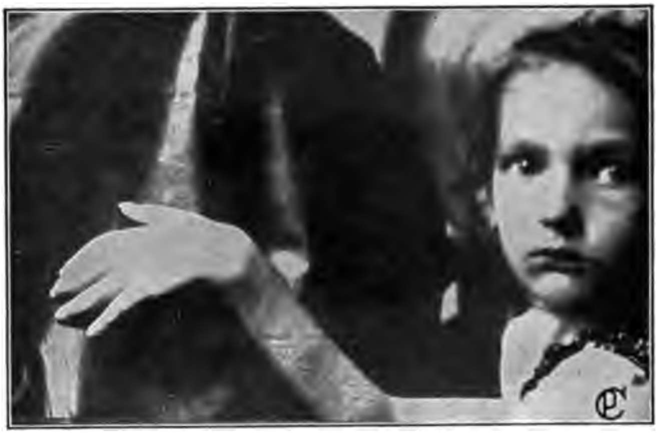

FIG. 134.— Volkman's ischemic paralysis, following fracture of the radius.

Pseudoparalysis.— True paralysis may be simulated by muscle weakness, as in rachitis or chorea. Close observation and the electrical reaction easily distinguish the condition.

Convulsions.

(*Eclampsia Infantum.*)

This symptom or symptom-complex results from a cerebral irritation producing a temporary unconsciousness, attended by irregular muscular contractions.

The symptom in the infant and young child often corresponds to the chill of the adult. It is quite commonly observed because of the relatively greater excitability of the brain and the undeveloped power of inhibitory control. We may divide the causative factors into two groups — the reflex or functional and the organic.

Etiology.— The peripheral disturbances which may cause a convulsive seizure are many and various. The susceptible age is in the first two years of life. An apparently trivial cause, such as psychic or sensory impressions resulting from unusual excitement in a child with an inherited unstable equilibrium, may produce a typical seizure. Foreign bodies in the nose or ears, traumatism, intestinal parasites, preputial abnormalities, improper or indigestible articles of food, poisons, and the toxemias resulting from or preceding certain diseases, as rachitis, malaria, or tetany, are among the causes producing convulsions. Rachitis deserves special mention as an underlying predisposing cause because of the nervous instability it produces.

The organic causes are meningeal hemorrhages at the time of birth, tumors of the brain, cerebral abscess, hydrocephalus, and the various forms of inflammation of the brain or its coverings. It should be recollected that regional as distinguished from general convulsions are indicative of organic lesions, and also that repeated seizures over prolonged periods are characteristic of cortical disease.

Description of the Symptom-complex.— The attack begins without warning. It may be preceded by slight twitching of the face and rolling of the eyes. There is then unconsciousness, the eyes are fixed and staring, tonic rigidity of the head, back, and extremities is shortly followed by clonic contractions of the facial muscles. These usually begin at the mouth, causing grimaces and distortions of expression and some frothing. The teeth are firmly set. The color is dusky. In a general convulsion all the extremities show clonic contractions and purposeless activity. The pupils are usually dilated and do not react to stimuli. The respirations are labored, affecting the pulse and causing irregularity of the heart action and increasing the cyanosis. There may be involuntary passage of urine and feces. After a variable time the muscular twitchings cease and the child passes from a coma into a deep sleep. The attacks may be and usually are shortly repeated unless influenced by treatment. After a period of sleep the child arouses and takes a normal interest in its surroundings; it may then be considered free from the danger of another immediate attack.

Prognosis.— This is usually good, but should be guarded until a definite cause is established. It is always serious if the attacks occur in the new-born, in advanced childhood, or if they are unduly prolonged and recur often. If convulsions usher in a disease they are not of as great prognostic importance as when they occur in the course of the disease. An exception to this statement must be made in cerebrospinal meningitis, in which initial convulsions are of bad omen.

Differential Diagnosis.— The essential characteristics are temporary unconsciousness and irregular muscular contractions.

In convulsions from organic causes, the regional involvement, often neuritis, and the resulting paralysis, may be distinguishing features. Epileptic seizures occur usually after the second year of life, they are apt to recur after longer periods and without an immediate causative factor. The history of predisposition may be obtained.

Treatment.— First overcome the attack or symptom. Some one in the family will in all probability have given a mustard bath before the arrival of the doctor. If the attack persists inhalations of a few drops of chloroform may be given, and if there is any fever an ice-bag is placed to the head. Meanwhile a soap-suds enema is prepared and given on general principles. If there is an elevation of temperature, the enema may be given cool at 70° F. Examine the fecal discharge for a possible etiological factor as some foreign substance ingested or for intestinal parasites. Keep the room noiseless. Follow the enema by a rectal injection of the bromid of soda grains ten, and chloral hydrate grains three, for a five-year-old child, if the twitching still persists. When the child can swallow, calomel or castor oil is given to rid the intestinal canal of possible toxins.

In the period of quiescence obtain a careful history, make a detailed examination and, arriving at a diagnosis, order such treatment as is suited to the underlying cause, as, for example, a properly balanced diet, with sufficient proteins and fats for rachitis.

Chorea.

(*St. Vitus' Dance; Sydenham's Chorea; Chorea Minor.*)

Chorea is a neurotic affection, characterized by purposeless movements of various parts of the body.

Etiology.— Girls are more often affected than boys. It appears most frequently from the fifth to the twelfth years of life. Rheumatism and tonsillitis are antecedent causes. It may develop as a result of fright, excessive school duties, intestinal autointoxications, or imitation of other choreic children. The offspring of neurotic parents are especially predisposed.

Pathology.— The theory that rheumatism, chorea, and endocarditis are related in many instances is gaining ground, and is certainly clinically of value. The toxin of rheumatism may affect the heart or the cortex of the brain in the Rolandic area, and causing irritation produce the characteristic movements seen in chorea.

Hypertrophied tonsils and valvular disease are not infrequently associated with chorea. The infectious theory is held by the majority of pathologists to-day, and these same observers believe in the infectious character of rheumatism and endocarditis.

Symptomatology.— The symptoms usually come on insidiously, and may not be noticed until quite marked. The child is chided for carelessness or awkwardness in dropping articles or for unnecessarily fidgetting. Nervousness and irritability of temper are noticeable. Upon little or no provocation the child begins to cry. The muscles in various parts of the body later begin to twitch and contract, the face making ludicrous grimaces. These movements are entirely involuntary, and if the examiner fixes the child's attention, these irregular movements are exaggerated. In the early stages the body movements may be slight, and are best felt when the child's hands are placed within those of the examiner and the arms put on a slight tension. The tongue also, when closely observed, shows the twitching movements quite early in the disease. During sleep the movements cease. Following a severe fright or chastisement chorea may suddenly develop with well-marked symptoms. Aggravated cases or those under no control are often pitiably affected: the child cannot dress or feed itself; sleep is disturbed; speech is altered and may be so changed as to be unintelligible. Pseudoparalysis, due to muscular weakness, may occur, but the extremity is never completely at rest for any length of time. On the other hand, a case recently under our observation in the Post-Graduate Hospital had such marked jactations that she had to be fastened in bed and fed by gavage until relief of symptoms was obtained by medication.

Hemichorea, in which the movements are confined to one side, is sometimes seen, and in these cases sensation is somewhat impaired on the same side.

There is no elevation of temperature, unless the case is complicated with rheumatism or endocarditis. It is not uncommon to find a mitral regurgitant murmur develop during the attack. Sometimes, in fact, it may precede it. Functional or anemic murmurs are heard in prolonged cases.

Course and Prognosis.— Chorea is in itself almost never fatal. Uncomplicated cases tend to recover in from one to several months. Ten weeks is the duration in the average case, but relapses are frequent.

Diagnosis.— This is, as a rule, quite simple, resting upon the characteristic muscular movements and especially the abnormal movements of the tongue. Imitative choreic movements are distinguished by their short duration, while in hysterical chorea the harmonious character of the movements and other hysterical phenomena serve to distinguish the neurosis. Sachs calls attention to the fact that choreic movements may be associated with infantile cerebral palsies and must be distinguished from true chorea. Spasticity and the increased reflexes should here put the examiner on the right track.

Complications.— Acute or subacute rheumatism, and heart disease, are the most frequent complications.

Treatment.— The treatment differs for the mild and severe cases.

Mild Cases.— Rest is the first and most important measure, as without it all treatment is unsatisfactory. The child should be immediately removed from school. By rest is here meant avoidance of all mental excitement or effort; physical rest being obtained by putting the child to bed in a well-ventilated room, and keeping it there until the coarser movements cease, when the child may be allowed up for a half-hour in the same room, and this allowance increased from time to time if good progress is made. Toys which require no mental effort on the part of the child are allowed, while reading and singing to the patient by the attendant serves to shorten the enforced rest. Visitors and the other members of the family are to be excluded. The diet must be carefully supervised. Milk alone for a few days and later cereals and vegetables, eggs and butter are allowed. Alcohol sponge baths or brine baths for their tonic effect may be given daily. Arsenic in the form of Fowler's solution is given as an adjuvant, but should not be depended upon to cure the patient without the rest treatment, as it is far from being a specific. Begin with three drops three times a day for a five-year-old child and increase gradually by one drop up to thirty drops daily. The arsenic should be administered after meals, well diluted in some alkaline water. It must be stopped if there is any nausea or puffiness of the eye-lids. In rheumatic cases novaspirin or the salicylate of soda may be given in conjunction with the above treatment.

Severe Cases.— The rest cure is imperative. A padded bed is sometimes necessary. The movements should be quickly controlled by doses of the bromids with chloral per os or per rectum, and then the arsenic treatment may be begun. If the chloral and bromids are not sufficient to control the jactations, a hypodermatic dose of hyoscin hydrobromate grains 1/200 for a five-year-old child will do so. This should not be used if there is any heart involvement. Veronal, grains 3, at night, will promote sleep if there is insomnia. Feeding through a tube must occasionally be practised. It is best to order a certain fixed amount of nourishment to be taken or fed during the day. If rheumatic arthrites complicates the disease, large doses of salicylates, up to 45 grains a day, may be given by rectum in a starch enema.

Convalescence.— School duties should be abandoned for some months. Life in the country, at the seaside, or in a suburban town, is advisable. Baths, iron tonics, and nutritious diet, including the fats and meats, are now indicated, for profound anemias are often concurrent with chorea and lead to relapses unless corrected. School life must not be resumed until such time as the possibility of a recurrence is well past. Enlarged tonsils should be removed.

Forms of Chorea.— Choreiform affections or movements are practically synonymous with habit-spasms and tics. (See page 473.) Huntington's chorea or hereditary chorea is a rare disease of a chronic nature and occurs in later life.

Chorea insaniens is a fatal form, which may be due to a bacteremia. Chorea major is a hysterical chorea under which are included several groups described mainly by German writers; for example, chorea electrica.

Hysteria.

True hysteria is a rare disease of early life, and is usually seen in children of the school age, especially in girls at puberty.

Etiology.— Heredity is an important factor, for if one or both parents are neurotic there is likely to be little or no control over the offspring; they are indulged in every whim, and too much attention is paid to minor ailments, and the imitative disposition of the child is often the precursor of real trouble. Children in institutions and asylums who receive only little personal attention from their superiors are often the victims of hysteria. Morbid sensations and psychical phenomena, such as fear, are productive of attacks.

Symptomatology.— The attacks do not present any great variation from those seen in adults. The tendon reflexes are not so often found exaggerated and disturbances of sensation are not commonly observed. It would be impossible to describe a typical case of hysteria, as certain groups of symptoms are in evidence in one case and entirely absent in another. The symptoms are traceable to defects in the various body functions, symptoms, and organs.

Sachs classifies the symptoms into three groups — psychic, motor, and sensory manifestations connected with vasomotor disturbances.

Under the first group are the weak-minded children with a perverse will. Hysterical mania may manifest itself if the child's wish is opposed, following a sudden fright or even a fit of anger. Alternate laughing and crying, with kicking or tearing of objects and clothes, occur, while the disturbance is made worse by attempts to console or sympathize. Hysteroepilepsy, while undoubtedly extremely rare in children, is of greater importance than some of the other hysterical manifestations. These children have a vicious family history, including alcoholism, insanity, etc. The attacks must be studied and epilepsy excluded after repeated observations. In hysteroepilepsy there is no aura. The bladder and rectal functions are not disturbed, the attacks are of longer duration, there is no complete loss of consciousness, personal injury is rare, and the movements themselves are tonic, exaggerated, and often purposeful.

A great variety of hysterical manifestations may be seen: those involving only the lower extremity or the head and neck alone. The esophageal spasm is not rare in girls at puberty (globus hystericus).

Sometimes paralysis follows the jactations or occurs alone as a hysterical manifestation. Again, only certain functions may be paralyzed. Hysterical aphonia is not uncommon, especially in institutions and asylums. They disappear quite suddenly when confidence is established, and local examination reveals a normal laryngoscopic picture. Any part or portion of the body may be affected. The regional paralysis is, moreover, usually associated with regional anesthesia. The condition of the reflexes which are not exaggerated and the absence of spasticity in the muscles and the unaltered electrical reaction serve to differentiate it from the true forms. Spasmodic conditions, such as hiccough, dysphagia, anorexia, and vomiting, sometimes occur and may be extremely troublesome. Spasmodic cough and purposeless screaming are especially seen in young girls. Hyperesthesia and anesthesia are not so commonly observed as in adults, but when present are apt to distort the diagnosis if the physician is not on his guard. Disturbances of vision especially must be kept in mind in this relation. Organic lesions, however, should be carefully excluded before a diagnosis of hysteria is made.

Prognosis.— This is better in children than in adults. Relapses are common if control is not absolute.

Treatment.— The acute attack may often be interrupted in children in the ordinary case by the use of the aromatic spirits of ammonia, not too well diluted, or by giving apomorphin in emetic doses. Cold douches, when unexpectedly applied to the face and chest, may arrest the attack. In intractable cases the rest treatment should be faithfully tried. If this is not effective a change of environment is then most important. The neurotic parent influences the child not only through the inherently weak nervous system, but by improper training and defective example. Sometimes it is necessary to send these children to special schools whose principals have made a study of neurotic children. Improvement in general physique is always to be aimed at and is attained by aerotherapy and nutritious plain food. The dietary should be supervised and a special list prepared for the needs of the particular child.

The suggestive influence of the physician who will exert his force of character and thus establish confidence can be made extremely powerful in its effect, and often produce a cure alone. Baths and douches have a distinctly favorable influence. The electrical currents are sometimes useful for their moral effect. Medicinal measures are rarely necessary if the above plan is feasible and strictly adhered to.

Epilepsy.

Epilepsy is a disease often occurring in early life, and characterized by seizures which vary in their intensity, affecting only a portion of the body, or they are generalized.

Etiology.— The children of neurotic parents, those who have themselves been afflicted with epilepsy, hysteria, chorea, and similar nervous diseases, may fall victims to this disease. To these may be added syphilis and alcoholism. Traumatism during or after birth and maldevelopment of the brain as a result of acute infective processes may later lead to epileptic seizures.

Among the exciting causes the intestinal toxemias, visual defects and obstructive growths in the respiratory tract, such as adenoids and polypi, may be mentioned.

Symptomatology. Petit Mal.— In this form there may at intervals occur momentary periods of unconsciousness. The child may suddenly cease playing or speaking and stare into vacancy. The parents may bring the child to the physician complaining of its "fainting attacks." If questioned, the child has no recollection or knowledge of these periods. If seen at the time of an attack, the pupils of the eyes may be seen to suddenly dilate and the face turn pale. Occasionally there is a period of drowsiness or the child seems dazed and is not willing to immediately resume its former occupation.

Grand Mal.— There is no sharp limit between the mild and the severe forms. Grand mal is spoken of if there is an aura, a period of unconsciousness, a convulsion, and the involuntary passage of urine and feces. It should be recollected that young children may not have an aura or may be incapable of interpreting it. Intelligent parents may sometimes foresee a coming attack by noting a change in the child's disposition or by observing certain unusual bodily movements. The sensation may be felt in different situations, as the stomach, the eyes, or various noises or sounds are heard in the ears.

The child suddenly falls into unconsciousness and a convulsive seizure takes place simulating the ordinary eclamptic seizures described on page 458. Sometimes an initial cry precedes the fall. The dilated pupils do not react to light, the tongue may be bitten, and blood-stained saliva may appear at the mouth, although this is not usual in childhood. After a few minutes the spasm relaxes and the patient is found to have involuntarily passed his urine or even emptied the rectum. Following the return to consciousness the patient is in a semicomatose or stupid condition, complains of headache, and often drops into restless sleep. Nocturnal attacks may be discovered only by the bitten tongue or drowsiness on the succeeding day. The "epileptic voice sign" of Clark and Scripture should excite suspicion in the medical attendant. It is described as a monotonous voice, the melody proceeding by even steps, and occurs in this disease alone.

Diagnosis.— Hysteria is differentiated from epilepsy by the absence of entire loss of consciousness, the stage of excitation with laughing and crying, and by the absence of dilated pupils and involuntary urination and defecation. Tumors of the brain may affect localized regions; they may have peculiarities of gait and changes in the fundus of the eye.

Prognosis.— The gravity is determined to a great extent by the age. The earlier the seizures appear the poorer the prognosis. Frequent recurrences of well-marked attacks are less hopeful and may be followed by feeble-mindedness.

Treatment.— During the attack the child should be placed in bed and guarded against personal injury. Little or no food should be offered after the attack until the period of drowsiness is past. The diagnosis once established, stringent prophylactic measures should be instituted to prevent recurrences. A life in a quiet country district, with an unusual amount of sleep and little mental exercise, is distinctly beneficial. A diet consisting of simple food (coffee and tea being absolutely excluded), with plenty of vegetables and fresh fruits to insure daily bowel activity, is required. For the children of the poor, life in the epileptic colonies, where the children conform to a certain routine, adds much to their chances of improvement.

The bromids, when administered in divided doses, five grains for a five-year-old child three or four times a day, while not curative, serve to reduce the number of attacks. When the latter occur at night only, it is best to administer one large dose, about twenty grains, at bedtime. This drug should be given to the point of toleration and resumed after a period of rest.

Headaches.

Headache is a symptom deserving of especial attention, since it may be symptomatic of many functional or even organic disorders.

Etiology.— It most frequently results among children from gastric or intestinal disturbances and from eye-strain. Anemic children who have been improperly fed and who are forced into competition with their schoolmates often suffer from toxic headaches. If the child remains in badly ventilated or superheated rooms frontal headaches frequently result. The cause may be more obscure and may be found to result directly or indirectly from adenoids, ear disease, nephritis, cardiac disease, and malarial poisoning. Young girls at the beginning of the menstrual period, especially if they are neurasthenic, may complain of frequent headaches. Many of the acute infectious diseases are preceded by cephalgia as a prodromal symptom. Meningitis and tumors of the brain cause persistent headaches which are referred to one area.

Migraine or sick headache occurs in older children. It is usually unilateral in character and preceded by nausea and vomiting and disturbances of vision.

Diagnosis.— The diagnosis depends upon a careful physical examination to exclude organic disease, and in obscure cases of this type lumbar puncture, the opthalmoscope and the tuberculin tests may be necessary. Functional headaches when dependent upon intestinal derangements are accompanied by a coated tongue, a fetid breath, and constipation. Those due to anemia and general asthenia exhibit pallor of the mucous membranes, lassitude, and depression. In these cases a blood examination, at least the Talquist hemoglobin estimation, should be made. Headaches due to visual errors begin, or are intensified, at the end of the school day or whenever the eyes have been overtaxed. An examination with the test cards (see p. 538) should be made as a matter of routine, as a more detailed ocular examination may then disclose astigmatism or other refractive errors.

The diagnosis of migraine depends upon the periodic unilateral attacks and the accompanying nausea and eye disturbances.

Treatment.— This is directly dependent upon the cause. When the headache is the result of digestive errors acute attacks may be relieved by clearing out the intestinal tract and prescribing a proper dietary which is to be strictly followed. Anemic headaches are cured by life in the open air or at least an abundance of fresh air and sunshine in the rooms which the child occupies. Reducing the number of study hours and prohibiting special studies after school may alone be sufficient. Obstructions in the respiratory tract and errors of refraction must be removed before any progress can be made.

A child suffering with migraine should be put to bed in a quiet, dark room, during the attack, and analgesics, as phenacetin combined with caffein or the bromids, may be given. A hot-water bag or light massage over the forehead and temporal regions may be agreeable. Future attacks must be prevented by strict regulation of the child's life and diet.

Insomnia.

This symptom which occurs in infancy and childhood generally results from some functional derangement which can usually be removed when once recognized.

The infant and child are dependent upon a sufficient amount of sleep to promote healthy growth. That it cannot or does not spend sufficient hours in sleep may be due to acute physical discomfort or from a perversion of its natural habits resulting from mismanagement on the part of its attendants.

The following table will give a general idea of the daily amount of sleep required in early life:

Healthy new-born.	20 hours, minimum 16 hours.
Six months.	16 hours (2 naps).
One to three years.	12 hours (and one nap).
Three to six years,	10–12 hours.
Six to ten years,	8–10 hours.

When the infant is unable to approximate the normal amount of sleep a careful examination of its mode of life should be made followed by a systematic physical examination. Among the more frequent causes of sleeplessness are digestive disturbances, undue excitement, bad hygienic conditions, and localized pain. Physical examination may show that the child is suffering from an otitis, skin lesions, enlarged tonsils, adenoids, rachitis, extreme anemia, or the disease may be organic, such as meningitis or incipient disease of the brain or spinal cord.

Treatment.— When the cause is found efforts should be made to remove or correct it before any other measures are undertaken. A careful regulation must be made of the child's daily life, not omitting what may seem to be minor influences bearing upon its sleeplessness. A well-ventilated, cool, darkened room should be provided, which the infant or child should occupy alone; the bed clothing should be light and not too warm. The evening meal must be simple, not containing too much liquid. Reading of exciting stories to children should be prohibited. These changes with an outdoor life are often sufficient to correct insomnia.

If a high temperature is the cause of the insomnia, baths or sponging with alcohol will often promote sleep. If temporarily any of the hypnotics are necessary, the bromids, in doses of one and a half grains for each year of age, or one grain of veronal for a two-year-old child, will produce the desired effect. The bromids combined with chloral hydrate are effective in older neurotic children, especially if they also have night terrors.

Pavor Nocturnus.

(*Night Terrors.*)

This condition occurs in children who have in some manner unduly excited their nervous system. They may or may not be the children of neurotic parents. Children from the third to the eighth year are more commonly subject to night terrors. In our experience the condition appears with the greatest frequency at the beginning of school life when unaccustomed responsibilities must suddenly be assumed. The reading of unnatural stories so often practised by nurses or unusual and grotesque sights, as in the circus, may induce an attack. A heavy meal just before retiring may also be a cause.

The children awake suddenly, usually before the midnight hour, and cry out, exhibiting signs of fright or terror. They are soothed with difficulty and can give no explanation of their sudden awakening or dream. If questioned in the morning they remember nothing of the occurrence. The terrors may repeat themselves several times in a week, but they seldom occur twice in the same night. When the cause is removed the recurrences become more infrequent and finally disappear altogether.

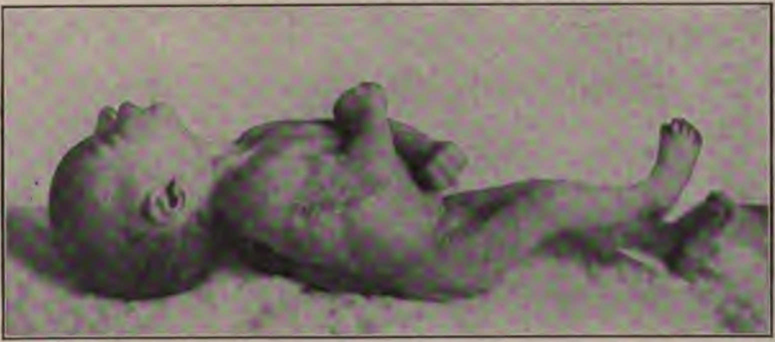

FIG. 135.— Tetany, with characteristic positions of hands and feet.

Treatment.— Every effort should be made to decrease the nervous excitability of the child by prohibiting school work at all for a time or decreasing the number of school hours. At home no supplementary teaching should be allowed and association with older minds not encouraged. A healthy amount of physical tire, rather than mental strain, should be the *desideratum*. The evening meal particularly should consist of light and easily digestible articles, and should be eaten at least an hour before retiring. If these measures are carried out it will rarely be necessary to give bromids or hypnotics.

Tetany.

(*Tetanilla; Arthrogryposis.*)

Tetany is a neurotic disorder characterized by intermittent or constant tonic spasms of the muscles of the upper and lower extremities.

Etiology.— The disorder is dependent upon the absorption of toxic products which readily affect the highly sensitive nervous system of early life. It occurs most frequently from the sixth month to the end of the second year. We would give rachitis the first place in the rôle of etiologic factors, and the conditions which may produce this disease may also produce tetany. This is further borne out by the fact that convulsions and laryngismus stridulus frequently occur in those subject to tetany. It also results from intestinal or peripheral irritation and may follow exhausting diseases or secondary pneumonias.

Defective parathyroid matabolism is believed to be an underlying cause of this and similar spasmophilic conditions. With this MacCallum associated defective calcium metabolism and treatment has been based on this deficiency. It also follows exhausting cases of measles, pertussis and typhoid fever. Peripheral nerve excitability is always present. An ennervated muscle group responds to both cathodal and anodal closing contractions when less than five milliamperes of current are used.

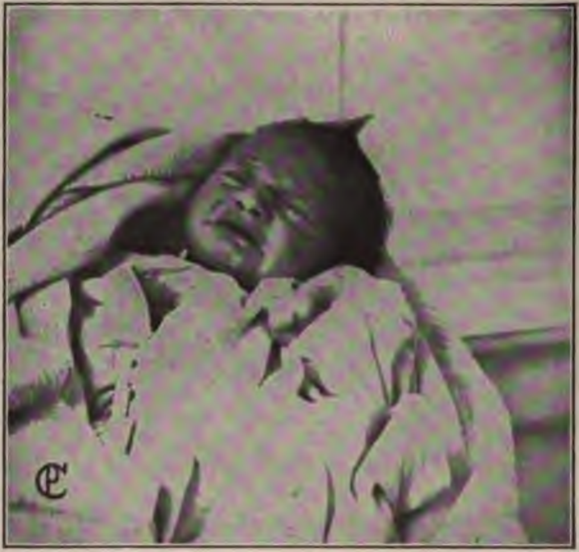

FIG. 136.— The face in tetany.

Symptomatology.— The condition begins without any warning in infancy, although older children sometimes complain or give evidence of an itching or tingling sensation. Attention is generally called to the condition by the muscular contractions of the hands and feet. A close examination will show that the arms are held quite closely to the chest, the forearms being partly flexed on the arms and the hand flexed at the wrist, while the fingers may either be tightly closed over the inverted thumb on the palm, simulating the driving position, or they may be hyperextended and held closely together like the obstetric hand. In the lower extremities the thighs may be drawn up onto the abdomen and the legs flexed on the thighs; some degree of adduction of the thighs is generally present. The foot itself is extended or hyperextended, and the toes are flexed. The position of talipes equinovarus being often assumed. We have also noted spasticity of the erector-spinæ group of muscles, so that the child could be raised by the head retaining an erect posture. The child's expression is one of discomfort. Pain is elicited if attempts are made to replace the extremities in their natural positions. There is rarely any temperature which can be attributed to the condition itself and the mentality is not affected. After a variable time, sometimes a few days or it may be weeks, the contractures intermit and the so-called latent period may be entered into, in which there is weakness and some slight spasticity of the affected muscle groups, or the symptoms may never return. In this disease certain phenomena may be elicited which are distinctly helpful in making or confirming a diagnosis.

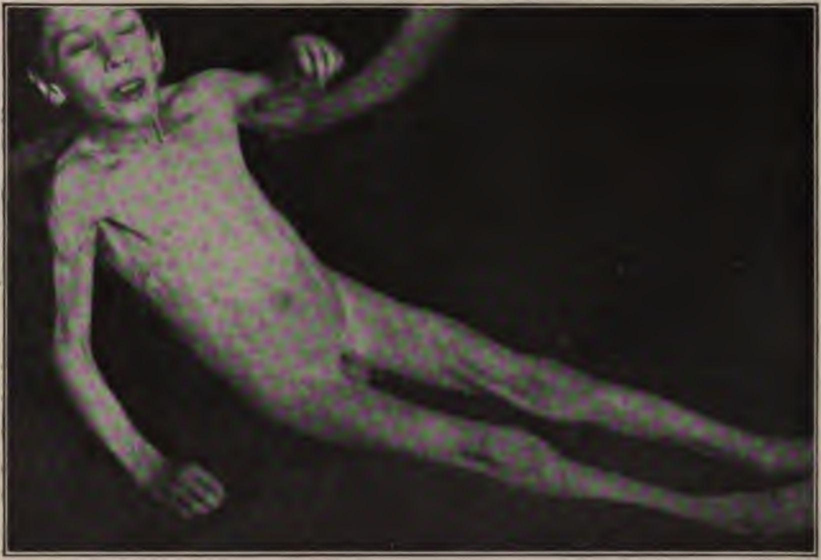

FIG. 137.—Pseudo tetany, characterized by trismus, and marked spasm of muscles; uninvolvement of upper extremity; mentality unimpaired.

Trousseau's symptom can be produced in the latent period by pressing upon the main nerves and arteries of the extremities. In this way a characteristic paroxysm can be produced which ceases when the pressure is removed.

Erb's symptom is dependent upon the increased electrical excitability in the peripheral nerves, muscular contractions being produced even by weak currents.

Chvostek's symptom is a facial phenomenon which is of value if obtained in conjunction with the others and is elicited by pressing the finger or any other blunt object over the facial nerve or tapping smartly over the exit of the nerve when contractions immediately occur of the enervated muscles.

Differential Diagnosis.— From tetanus it may be distinguished by the absence of trismus which is an early symptom, by the lack of fever, by the intermittent attacks, and the ability to elicit Trousseau's, Erb's and Chvostek's signs. Cerebrospinal meningitis is distinguished by the presence of high irregular temperature, cerebral signs, and by lumbar puncture.

Prognosis.— The prognosis is mainly dependent upon the underlying cause. In itself it rarely endangers life except by predisposing to convulsive seizures. Relapses are not uncommon, especially in those cases due to nutritional disturbances.

Treatment.— The underlying condition must be carefully sought for and treatment immediately directed toward its removal. It is a safe rule to thoroughly empty the bowels by the use of a large dose of castor oil or calomel. An enema may be given for immediate relief. The stools should be kept for the physician's examination, as he may therein find the source of the peripheral irritation, such as badly digested food or intestinal parasites. Baths at a temperature of 110° F. may be given two or three times during the day for their relaxing effect. In severe cases a mixture of chloral hydrate and the bromid of soda can be injected into the rectum. In the latent period dietetic measures should be coupled with most favorable hygienic conditions. The food ordered must be such as to overcome the rachitic manifestations if present (see p. 413), or to produce an increase in weight if the neurosis has resulted from an exhausting disease. Calcium lactate 2-5 grains three times a day, may be given to supply calcium deficiency.

Myotonia Congenita.

(Thomsen's Disease.)

Myotonia congenita is a rare disease, mainly hereditary, characterized by a sudden rigidity of certain muscle groups when a voluntary movement is attempted.

Etiology.— The disease may occur early in childhood, but the greatest number of cases are seen between the fifteenth and twenty-fifth year. Thomsen believes it to be a hereditary disease; five generations in his own family having been so afflicted. Inclement, cold weather and emotional states may bring on the attacks.

Symptomatology.— The muscular contractions develop when the patient attempts some voluntary act, as rising from bed or from a chair. The muscular spasm prevents the completion of this effort, and repeated attempts are necessary before it is accomplished. These inhibited efforts in a child otherwise well developed are striking enough to fix the diagnosis. If a sharp blow is given over a muscle, a tonic contraction occurs which persists for some time. Erb has shown that the muscles react peculiarly to electrical stimuli. This "myotonic reaction," as he calls it, is a valuable confirmatory sign. Faradic currents stimulate the muscles, producing wavy, rythmical long-continued contractions. The same effect may be produced by the galvanic current.

Diagnosis.— The disease is distinguished from tetany by the contractions produced by mechanical stimulation and by the peculiar electrical reaction (Erb's myotonic reaction). Furthermore, there is no increase in mechanical excitability by pressure over the nerve or vessel trunks as in tetany. Congenital paramyotonia (Eulenberg's modification) may be differentiated by the absence of the myotonic electric reaction and also of any increase in the mechanical excitability.

Treatment.— Thomsen noted that the symptoms appeared less often the greater the muscular activity of the patient; he therefore advised a life which would necessitate a constant use of the muscles.

Paramyoclonus Multiplex.

This disease, although very rare in early life, is mentioned here mainly for the purposes of differential diagnosis. It is characterized by the production of repeated momentary clonic spasms affecting a certain muscle or groups of muscles which are usually symmetrically involved. The muscles of the face are rarely involved. A slight tremor of the muscles may be observed between the attacks which usually follow some strong emotional excitement or physical effort.

The myotonic reaction is rarely increased and no change in electrical excitability is noticed.

Treatment.— We are almost powerless to effect a cure in this disease, although amelioration of the symptoms is possible by the use of sedative baths, mild gymnastic exercises, and a life free from excitement.

Angioneurotic Edema.

(*Acute Circumscribed Edema.*)

This is a vasomotor disturbance, trophic in origin, characterized by attacks of circumscribed edematous areas on the body.

Gastrointestinal intoxication is the most frequent cause in children, although it sometimes appears without any discoverable reason. The edema may be well-marked a few hours after its inception and may just as suddenly disappear, only to reappear in some other portion of the body. There are no marked constitutional symptoms, the children simply complaining of the itching or the discomfort caused by the edema when it affects, for example, the face.

In a case seen by one of us there were unquestionable signs of edema of the lungs, which appeared suddenly, and cleared up within forty-eight hours. The area affected is raised, pale in the center, with an irregular bluish-red margin, differing from the other edemas in that it does not pit on pressure. Fatal cases have been reported in which the larynx and pharynx were affected.

Treatment.— Special treatment during the attack is hardly necessary. Compresses wrung out of warm boric acid solution are soothing to the patient. A saline purge should be given and future attacks inhibited by scrupulous attention to the dietary.

Tics.

A tic is the unconscious activity of a group of voluntary muscles resembling a purposeful movement, its frequent repetition classing it as a habit.

They occur most frequently in children from the fifth to the fourteenth year of life. An underlying neurotic element can usually be found in the patient or he has been trained under attendants who by their management have not developed his self-control. These neurasthenic children may easily develop a tic from some primary source of irritation, as foreign objects or growths in the air passages or eyes, skin diseases, phimosis, or even chorea. They may arise from emotional disturbances or as a result of imitation, as pointed out by Scripture, in children of unstable and willful disposition. The most common tic is the one involving the muscles about the eye in which the child rapidly winks the eye-lid several times in succession. This occurs at short intervals during the day. Not unlike these in motor characteristics are the tics affecting the face, scalp, ears, tongue, neck, and extremities. When tics are accompanied by mental disturbances, a child otherwise rational may repeat words or phrases of an obscene character without provocation or regard to the time and place. This is known as coprolalia.

Differential Diagnosis.— Tics may be distinguished from chorea by the purposive, systematic nature of the movements which occur at intervals. The spasms of paramyoclonus multiplex affect only a certain muscle and are not controlled by fixing the attention. Habit spasms resemble normal movements, but differ from them in that they are unnecessary. They are unlike tics in that they are not convulsive in type.

Stuttering and Stammering (Hyperphonia.)— In this connection another class of tics forming a large part of the speech defects of childhood may be considered. Scripture defines hyperphonia as a psychomotor neurosis or a mental tic or habit over which the patient has no control and which is the result of a compulsive idea connected with speaking. A neurotic child may acquire the habit by imitating others or he may have some defect connected with his respiratory apparatus.

The symptoms have been divided into spasms and hypertonicity, affecting the respiratory, laryngeal, and articulatory muscles; to these are sometimes added facial and bodily tics.

Treatment.— A careful physical examination, including the special organs, and an inquiry into the details of the child's life should be made in every case. An underlying and neglected cause may be found in refractive errors, abnormalities in the nose, ears, or teeth. Peripheral irritation from any source must be removed. While this is not curative, it is conducive to a more rapid recovery and prevents recurrences. The physical condition of the child should be improved by nutritious food, tonic baths, ample amount of sleep, and a routine life under judicious discipline. A change of environment will often make the special treatment much more effective. Fowler's solution may often be given with benefit. In a number of our cases the method advocated by Scripture was remarkably effective. It depends upon the voluntary imitation of his own act by which the child is trained to a conscious performance of the tic. In this way he is encouraged and enabled finally to inhibit the act. The child looks into a mirror and is directed to imitate five times in succession his own tic when it appears. At first the imitation is a poor one, but improves with practice, until finally complete control is obtained.

Scripture's method for stuttering and stammering consists in introducing melody into the monotone voice of the stutterer. The child is directed to repeatedly sing a line of some familiar song; he is then taught to speak a sentence in the same sing-song fashion. In this way the monotone voice is finally abandoned and cadences and inflections are introduced. The " melody cure " is founded upon the fact that a stutterer never stutters when he sings. This simple treatment is elaborated by encouraging the child in forms of elocution and graceful mannerisms.

Finally, in some cases it is also necessary to distract the mind when the patient starts to speak; this is done by teaching him to beat time in a quick, vigorous manner as he starts to speak or to set himself off by repeating *one, two,* and starting off to speak on *three.* These lessons are given at first three times a week for half-hour periods, the time and interval being lessened as progress is made.

CHAPTER XXXV.

DISEASES OF THE PERIPHERAL NERVES.

Multiple Neuritis.

Definition.— An inflammation of the peripheral nerves, in some of which there is a tendency to acute degenerative changes. It may affect several nerves, usually symmetrically, or it may be general.

Etiology.— Bacteria or at least bacterial toxins in all probability cause the disease. The infectious diseases, especially measles, malaria, influenza, typhoid, and tuberculosis, may be followed by a polyneuritis, but it is a rare complication, with the exception of diphtheria. Sometimes exposure or cold and rarely alcohol, arsenic, or lead cause the disease. Alcohol must be considered as a factor in treating the children of our foreign population.

Pathology.— There is an inflammation of the affected nerve, interstitial or parenchymatous in character, followed by more or less complete degeneration of the fibers. The appearance of the nerve at first is that of an acute inflammatory nature, with swelling, hyperemia, and minute hemorrhages in the nerve sheaths. Later degenerative changes in the nerve fibers only are seen. The muscles undergo parenchymatous or even interstitial changes.

Symptomatology.— The onset may be sudden, with a chill or a convulsion and fever; as a rule, however, it is gradual. The mother may notice that the child is unable to properly support itself on its feet: if forced attempts to walk are made the child stumbles or sinks to the floor. After a few days or sometimes within a few hours there is intense pain on handling. The child cries when approached, fearing the pain of motion. Occasionally the sensitiveness along the course of the nerve may be elicited. Paralysis now follows the muscular weakness and it progresses symmetrically. The child may continually moan or cry out with the pain, but does not refuse its food. Foot-drop and wrist-drop develop, and the muscular contractions may cause deformities. Tendon reflexes are abolished altogether, or at least diminished, and the reaction to the galvanic current is slow. Muscular atrophy develops, but is not marked.

Diagnosis.— The history of an antecedent disease or a distinct causal factor, as alcohol, may be suggestive when pain and paralysis ensue. The association of motor and sensory symptoms or paralysis along anatomical lines and the changed electrical reaction should cause no confusion. When there is lordosis present from involvement of the muscles of the back, it may be mistaken for Pott's disease, but the deformity is not angular and the position assumed will differentiate it.

Course and Prognosis.— Cases with sudden onset in which the electrical reaction is rapidly changed and in which atrophy occurs early are not favorable for recovery. The average case begins to improve after the first month, recovery generally being complete in three months. The sensory symptoms clear up first, then the reflexes are obtained. In some cases the paralysis may be permanent. Involvement of certain nerves, as the vagus, or intercurrent diseases may bring on a fatal issue.

Treatment.— If the disease is due to a drug or alcohol poisoning this must be stopped at once and eliminatives given. An initial dose of calomel is always in order. The child should be placed in a comfortable attitude, the limbs encased in cotton wool and lying on a down pillow. The pain should be controlled by analgesics, such as the bromids, phenacetin, or even codein if necessary for one or two doses. Rest and hot applications during the onset, and later massage and vibratory treatment as it is given in infantile spinal paralysis is effective. If the extremities are kept in a proper position while the disease is in progress, deformities are not likely to result and orthopedic appliances will not be necessary.

Diphtheritic Paralysis.— This is a form of multiple neuritis worthy of special note. It is the most common cause in early life and affects for the most part only one region, that is the palate. We do not meet with the condition as frequently since antitoxin has come into general use. It is less likely to follow if the diphtheria has been recognized early and the child injected with the serum at once. We have, however, seen a fatal issue in cases that were considered extremely benign and in which the prognosis was excellent. Children under two years of age are rarely affected. Malignant laryngeal cases are more susceptible of involvement. It sometimes occurs during the active process, but usually it appears in the third or fourth week of convalescence.

Symptomatology.— Inability to swallow well with regurgitation of fluids through the nose or a peculiar nasal twang in the voice may first attract attention. The eyes may next show the paralysis, and if this is more extensive the lower extremities are affected, followed by similar changes in the arms and the muscles of the trunk. Examination of the throat will easily disclose a paresis of the pharynx and soft palate; it is relaxed, flabby, and does not take part in the acts of speaking or swallowing. Closer examination of the eyes shows weakness of the ciliary muscles, the pupil reacting sluggishly and causing defective vision. When the external ocular muscles are paralyzed, strabismus results.

Following the laryngeal cases the loss of voice is particularly marked and persistent, and if the paralysis occurs during the intubation period difficulty may be experienced in keeping the tube in place. Recovery is the general rule; fatal cases resulting from the involvement of the vagus, or from aspiration pneumonia when the epiglottis is involved. The course depends upon the extent of the paralysis and the regional involvement. The average case requires two months for recovery. The muscles of the eyes and the palate recover much more quickly than the muscles of the extremities. Weakness of the back and inability to properly support the head, with the loss of the reflexes, may persist for months.

Treatment.— Rest in bed and close observation should be insisted upon when the first symptoms of paralysis appear. The management will depend upon the extent of the regional involvement. Certain cases in which there is only aphonia or partial paralysis of the palate will require no special treatment, but the heart in all cases should be carefully watched and stimulation given if necessary. Strychnin nitrate has served us the best for this purpose. Where deglutition is interfered with gavage may be necessary, although careful feeding from the spoon in small quantities can usually be successfully practiced. The food should be as nourishing as possible, and the appetite and general health are improved by placing the patient as much as possible in the open air.

Facial Paralysis.

(Bell's Palsy.)

Paralysis of the seventh nerve is not an infrequent affection in infants and children.

Etiology.— During infancy it may occur as a result of pressure upon the nerve with the forceps or in contracted pelves from impaction upon the head. Caries of the petrous portion of the temporal bone accompanied with inflammatory exudates may cause paralysis by pressure on the nerve.

In children over three years of age sudden exposure to cold, which in all probability induces an infection, is the commonest cause. It may also accompany or be produced by traumatism within the skull, basilar forms of meningitis, polioencephalitis, and tumors of the brain. We frequently see this paralysis following the radical mastoid operation in which the nerve may be temporarily injured or destroyed.

Symptomatology.— Inspection of the child's face will show a droop at the mouth on the affected side and the natural folds in this region almost or quite disappear, while the angle of the mouth is drawn down. The child cannot close its eye, and if attempts are made to do so the eye-ball moves upward. It can only blow out the cheek on the unaffected side. The protruded tongue deviates to the unaffected side and food particles may lodge between the cheek and gums. Speech may be affected, while attempts at whistling or laughing accentuate the paralysis.

Prognosis.— This is good for those cases due to sudden chilling. Pressure palsies at birth may recover in whole or in part. If due to destructive disease in the petrous portion of the temporal bone or to intracranial diseases, the prognosis is bad. Following operative procedures the prognosis depends upon the amount of traumatism the nerve has sustained, and many of these cases slowly recover even after complete section.

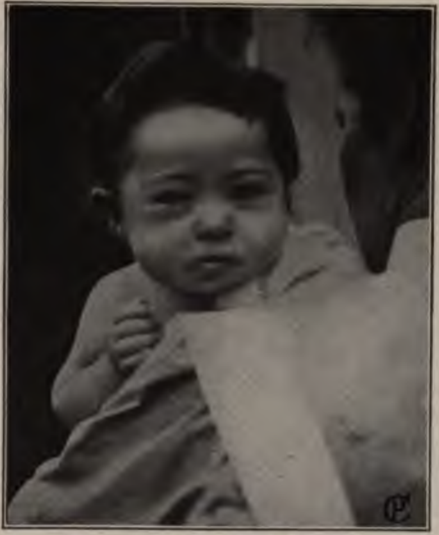
FIG. 138.— Facial Paralysis.

Treatment.— In the mild cases recovery will take place without any treatment. The galvanic current is used in the severer cases and in those which follow operative procedures in conjunction with massage and mild vibratory treatments. As the power returns the child may be encouraged to exercise the muscles by imitating grimaces or blowing upon musical instruments. If a neglected otitis media is the cause, surgical procedures are indicated.

CHAPTER XXXVI.

DISEASES OF THE SPINAL CORD.

Myelitis.

Myelitis or inflammation of the spinal cord may be divided according to the course into an acute, a subacute, and a chronic form.

Etiology.— It may result from severe injuries or even considered mild in character. It may follow the acute infectious fevers and septic processes anywhere in the body. It may extend or result from a meningitic process. It may also be caused by new growths in the spinal canal. Syphilis and Pott's disease, however, are the two causes which are most common in children.

Pathology.— The cord on section, in the affected areas, shows a congestion of its meninges, while the cord itself has been changed to a soft pulpy mass. The white matter is with difficulty distinguished from the gray. Minute capillary hemorrhages are found throughout the gray matter and the cells in the anterior horn show marked degenerative changes. The blood-vessels of the cord are dilated with proliferation of leukocytes, amalacious bodies, and degenerated axis-cylinders. In the subacute or chronic forms some evidences of sclerosis may be found.

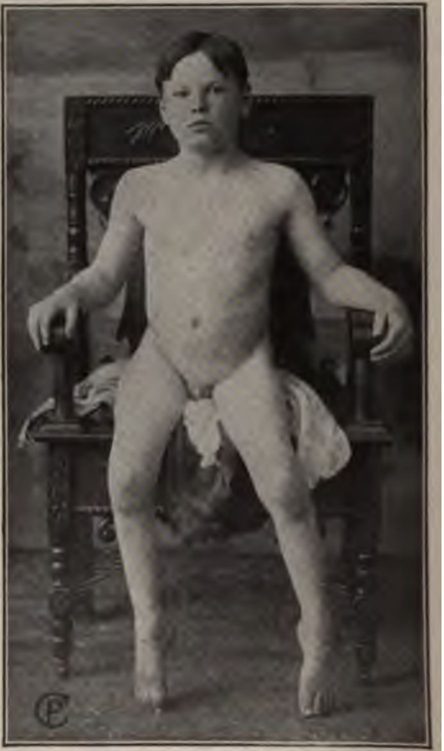

FIG. 139.— Lumbar myelitis, showing contractures and deformities.

Symptomatology.—In acute myelitis there is a sudden onset with a temperature which may rise t 104° F. as a result of the infective process. Painful areas may b elicited on pressure along the spine or the tenderness may be subjective

Clinical evidence will soon appear of functional disturbance of the cord and will vary with the intensity and localization of the process. The myelitis will affect motion and sensation and derange the functions of the bladder and rectum. Paraplegia results, and anesthesia will be present in the parts of the body supplied by the nerves which originate below the involved area. Thus there is loss of such sensory impulses as pain, touch, thermal and muscular sense. A hyperesthetic zone, due to the irritation of the nerve fibers may be present above the anesthetic area. The reflexes are disturbed depending upon the area involved.

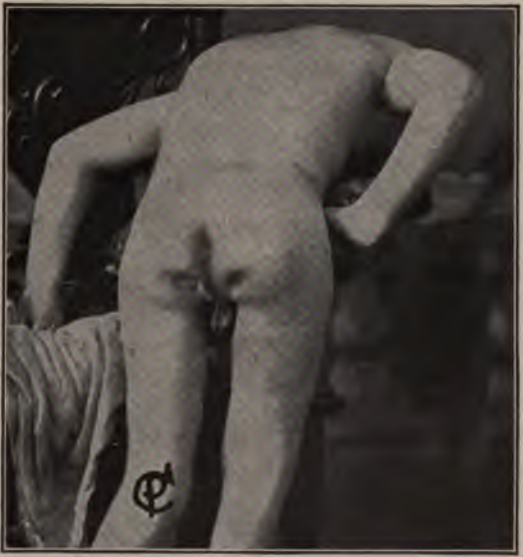

FIG. 140.—Bed-sores in myelitis.

Cervical lesions cause a paralysis in all four extremities. In the arms it will be flaccid in type, while in the lower extremities the palsy will be spastic in character. The whole body is anesthetic below the neck. In the dorsal region which is most commonly affected in children the upper extremities are not involved, while the lower become spastic. The patellar and plantar reflexes are increased and ankle clonus is present. Lumbar lesions produce a flaccid paralysis in the lower extremities which is later accompanied by some degree of atrophy. The urine dribbles away and the rectum is incontinent. The reflexes are lost and sensation is absent to a point above the lesion. Bed-sores, the result of trophic [illegible], cystitis, and infections of the urinary tract easily occur, and [illegible] bring the case to a fatal issue. Contractures and deformities may result in the extremities unless measures are taken for their prevention.

Diagnosis.— The etiological factor, the sudden onset, the paralysis of a flaccid type above and spastic below, accompanied with anesthesia and derangements of the bladder and rectum should make the diagnosis easy.

Prognosis.— Lesions in the cervical region are the most dangerous to life. Myelitis in the dorsal and lumbar region may cause death from infective processes arising in the bladder, rectum, or from bed-sores. The younger the child, the more unfavorable the prognosis. Syphilitic cases, if the diagnosis is made early, give favorable results under specific treatment.

Treatment.— Acute Stage.— Absolute rest in bed on an air mattress is essential. Ice bladders may be placed over the spine while the fever is active and for the relief of pain. The bowels are emptied by a brisk cathartic, and the bladder relieved by an attendant accustomed to surgical cleanliness. In syphilitic cases the mercurials with the iodids are given. If there is intolerance to these, the mercury may be given by inunction. If a specific infectious process can be demonstrated, such as streptococci, and isolated from the patient's own blood, treatment by vaccines may be tried. Bed-sores must be guarded against by scrupulous cleanliness, frequent change of position, and the daily application of alcohol or astringents. If they do develop they should be thoroughly cleansed and treated with stimulating antiseptics, such as silver nitrate.

After the subsidence of the acute symptoms, skilled massage may be employed in conjunction with warm tonic baths. Arrangements should be made so that the child can be taken out of doors on a roller bed or chair so that its nutrition may be preserved and its desire for food stimulated.

Multiple Sclerosis.

(Disseminated Sclerosis.)

The disease may have its inception in, or it may be associated with any of the acute infectious diseases.

Pathology.— Throughout the central nervous system patches of sclerosis are found. They may be more frequent in one area than in another, invading the brain, the pons, the medulla, the lateral and the posterior columns of the spinal cord, or even the spinal roots may be affected. Closer examination shows that the myelin sheaths of the nerve fibers are destroyed, although the axis-cylinders in the sclerotic areas do not suffer.

Symptomatology.— At first there may be weakness of the upper and lower extremities accompanied with some trembling of the hands and the development of a spastic gait. This is followed by an intention tremor which is quite characteristic of this disease, and which is accentuated by voluntary action on the part of the patient. It disappears when the extremity is at rest. Later in the disease the tremor may be so intense as to prevent the ordinary activities, as dressing or eating, etc. A speech defect now appears: it is slow, deliberate, careful, with a tremulous character. It is spoken of as scanning speech. Nystagmus or oscillation of the eye-ball appears at this time and is especially marked when lateral movements are attempted. The pupils usually are contracted and reaction of accommodation to light is sluggish. The mental faculties become impaired, memory particularly is poor, and sudden emotional changes occur on the least provocation. The expression of the face becomes dull and stupid. A spastic form of paralysis, not very apparent at first, later becomes well-marked, producing a spastic gait. As the disease advances the tremor becomes so intense that walking is impossible, and finally the patient is bed-ridden. After a long and tedious course the disease finally ends fatally, the patient dying of some intercurrent disease.

Treatment.— All that can be done for this incurable disease is to regulate the life of the patient so that an unusual amount of rest is secured and the muscles kept in good condition by baths, massage, vibratory treatment, and the galvanic current. Drugs do not influence the disease, and if given at all they should be prescribed for symptoms as they arise.

Hereditary Ataxia.

(*Friedreich's Ataxia.*)

This is a disease occurring in the members of the same family and characterized by an ataxia with a slow but progressive course.

Etiology.—The disease is hereditary in character, passing often through several generations. The males or the females of a family inherit the disease. The spinal symptoms in some cases predominate, and in others the cerebellar are more in evidence. The spinal form occurs in the ages of four to seven, while the cerebellar form is rarely seen before the twentieth year.

Pathology.— The changes found are in the posterior roots. There is sclerosis of the posterior columns. The spinal cord as a whole is smaller than normal. In some cases the lateral tracts and the columns of Clark are atrophic, especially in the type known as the cerebellar, in which there is a marked diminution in the size of the cerebellum and degeneration of its nerve tracts.

Symptomatology.— The gait is the first symptom to attract attention. The walk is swaying in character, with the legs held apart (sailor fashion); even while sitting and standing the patient cannot control his position accurately. Athetoid movements or tremors are present, especially in the extremities. Hyperextension of the great toe may be an early symptom, and later deformities, as pes equinus, may develop. Romberg's symptom is obtained in the

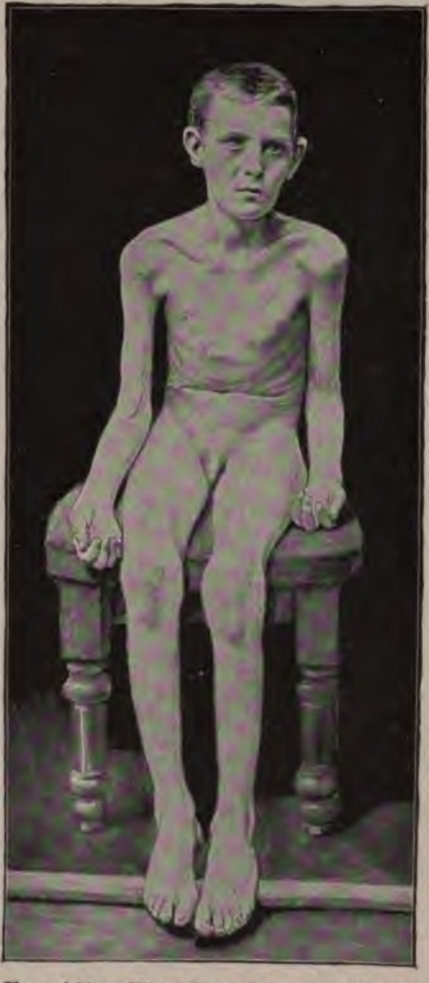

FIG. 141.— Hereditary ataxia (*Friedrich's disease*). (*Sachs.*)

spinal cases, but is more strongly marked in the cerebellar type. The patellar reflex is variable and inconstant, and cannot be depended upon for much diagnostic aid. The cutaneous reflexes also remain quite normal. Atrophy of muscle after a time occurs and produces such deformities as scoliosis and thus destroys the normal spinal curves. Nystagmus is a quite constant symptom. The pupils are normal, but other ocular disturbances, as ptosis and strabismus, occur. Optic atrophy is not rarely found in the later stages. Dysarthria is commonly present. Sensation is unimpaired. The sphincters do not suffer. As the disease progresses signs of failing intellect are observed; these may be preceded by dizziness or hysterical phenomena.

Differential Diagnosis.— Tabes dorsalis may be differentiated by the absence of lightning pains and sphincteric changes, and again the ataxic gait is rarely seen in infantile tabes, while the pupillary changes are frequent. New growths of the cerebellum might simulate a beginning ataxia, but the course is more rapid and there is headache and vomiting.

Course and Prognosis.— The disease is extremely slow in its progress. Eventually, after years, the patient is bed-ridden after the musculature is invaded. Death occurs from some intercurrent malady. The prognosis is invariably bad.

Treatment.— A nutritious diet, massage, hydrotherapy, and the best possible hygienic surroundings are our only recourse. Medicinal treatment is symptomatic only. Iron is necessary for the anemia.

Primary Myopathy.

(*Muscular Dystrophy: Idiopathic Muscular Atrophy.*)

For the purposes of clearness and to prevent the confusion which must arise in the mind of the reader attempting to gain information on this topic, we will embrace all the various described types under this one general title of the myopathies.

Clinically, these types have been separated on a basis of age, as the juvenile (Erb type) and the infantile type; on an anatomical basis, for example, the facio-scapulo-humeral type (Landouzy-Dejernie); and still another type is based on the distal involvement, *i.e.*, those in which the proximal parts of the body remain intact for many years and only the distal parts are affected; finally on an objective basis, in which there is enlargement or apparent hypertrophy of portions of the body (pseudo-hypertrophic muscular paralysis of Duchenne).

Pathological classification offers no relief at present from the apparent confusion, as the study of muscle components and muscle embryology has not as yet advanced sufficiently to warrant such a classification.

Etiology.— Gowers suggests that the myopathies are due to an inherent defective vital endurance. Collins says they are an expression of prenatal inadequate endowment. Maternal heredity seems to have a distinct place, while paternal heredity because of the early impotency of the diseased father is to be disregarded. Several members of one family may be attacked. The affection usually begins about the sixth to the eleventh years of life, although cases have been reported occuring at birth, and as late as the thirties. Boys are more frequently seen with the disease than girls. A history of trauma is often given as a cause by the parents, but may be disregarded in a disease of this causation. The acute exanthemata, especially scarlet fever, may so lower the resistance that the disease is more readily ushered in.

Pathology.— Various anatomical changes have been found, but the reports are various and confusing. The nervous system does not seem to be involved in so far as modern technic can discover in the normal case. Gowers rejects the theory that the disease may be a trophoneurosis. The cells in the dorsal ganglia have been found shrunken by Brooks and others. The muscles themselves show the true pathological changes. Atrophy and hypertrophy of muscle fibers may be seen in the same specimen. Fatty deposits and connective-tissue increase are likewise found. In some cases (the pseudohypertrophic type) the adipose tissue is in excess, while in others (the so-called sclerotic type) the connective-tissue elements predominate. In the latter form the muscles become firm and thin and later simply degenerate into fibrous bands. The lipomatous type is never hard, but soft and flabby.

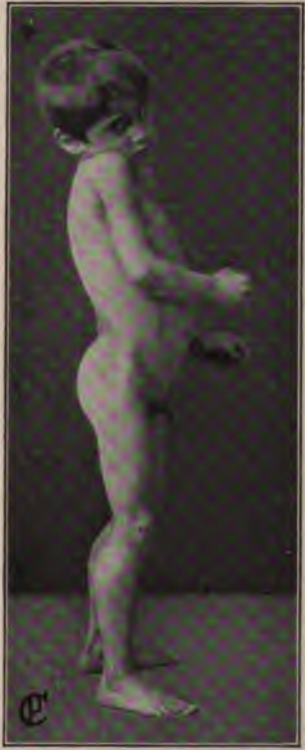
FIG. 142.— Pseudo-muscular hypertrophy: note size of calves as compared to upper extremity.

Symptomatology.— The first symptom noticed may be a weakness in walking or clumsiness in going up or down stairs; later the child stumbles or falls on slight provocation. These symptoms come on very gradually, so that they are often considered negligible in the dispensary patients, especially as they seem to be physically in very good condition. The calves may seem to the laity to be unusually well developed. When the disease is more advanced the gait becomes waddling, the legs are not lifted much from the ground. If a test is now made a very characteristic attitude will be assumed, namely that of "climbing up on himself;" especially if the patient attempts to pick an object from the floor. If placed on his back on the floor, the patient is obliged slowly to turn face downward, get on his knees with the aid of his arms, then raising his knees he forms an arch and now by grasping his knees he works his hands higher and higher up the thighs until he can assume the erect posture. In advanced cases even this is impossible and the child is finally bed-ridden. The knee and ankle reflex are diminished, and in terminal stages entirely absent.

The posture is also quite characteristic. Lordosis is sometimes seen quite early, and at this time it disappears if the child is asked to sit down. As the disease advances, the lordosis is more marked, the head and pelvis is held well back and no change is observed in the sitting position. The face loses its original expression, becoming dull and mask-like. When the disease is well advanced even closure of the eye-lids is accomplished with difficulty and articulation is imperfect. All these changes are due to atrophy of the facial muscles in some degree. The lower extremities, while mainly involved, are not alone affected. After several years the shoulder group muscles begin to lose their power, the patient is unable to raise his

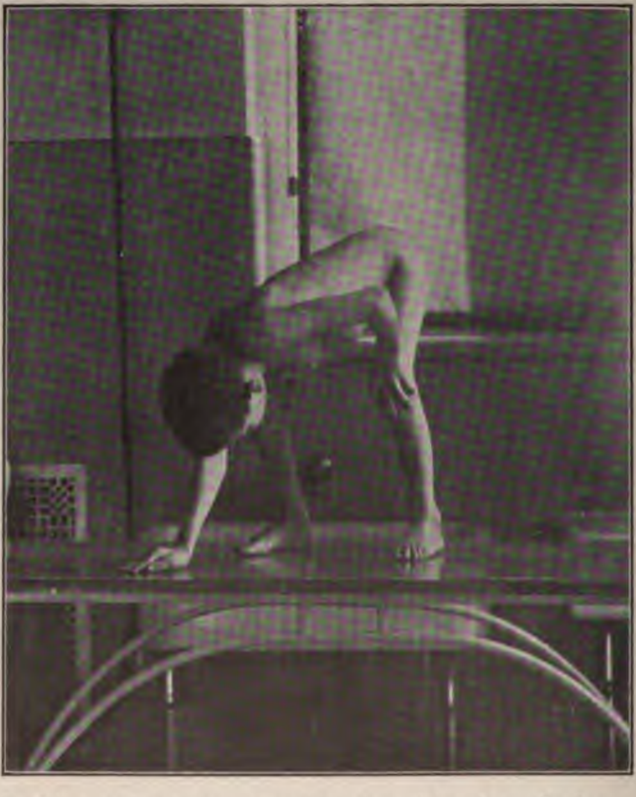

FIG. 143.— Position taken by the myopathic when rising from the floor. (*Collins.*)

arms and flex his elbows, but they still are able to perform the finer movements of the hand. The supraspinatus muscle Gowers describes as being almost the last to become affected. The atrophic muscles allow the shoulder blades to recede from the thorax, forming the winged scapulæ so often observed in the myopathies.

Electrical Examination.— Reaction of degeneration is not obtained. There is, however, lessened excitability to both currents.

Complications.— Fractures, contractures, and deformities may occur in these cases. The fractures are due to the stumbling or awkwardness of the patient. Various theories have been advanced by neurologists for the contractures, but suffice it to say, that they are of all possible varieties that are reducible and subject to relapse.

Collins and Climenko give the following order in which the muscles are involved:

Dense, Thickened Muscles.— Calves, sartorius, glutei, triceps, deltoids, infraspinati.

Atrophy.— Pectoralis major, trapezius, serratus magnus (anterior portion), latissimus dorsi, biceps, quadriceps femoris, abductors.

Differential Diagnosis.— The characteristic features are the disproportionately enlarged calves, the peculiar facies, the gait, the lordosis and the peculiar attitude assumed when arising from the prone position. Atypical cases are often puzzling and must be differentiated from anterior poliomyelitis in which there is a regular corresponding distribution of the affected muscles to the portion of cord involved, while in dystrophy this is not so. In chronic progressive anterior poliomyelitis, there is, besides the regular muscle grouping, the reaction of degeneration and the absence of pseudohypertrophy. In syringomyelia the early involvement of the finger muscles serves as a guide, for in the dystrophies these often remain unaffected to the last. Progressive muscular atrophy may be confusing, but the age, the origin in the digital muscles and the fibrillary twitchings which are present will distinguish the disease.

Treatment.— These cases, unfortunately, are not amenable to cure. Much can be done, however, by obtaining complete control of the patient's daily life. Directions should be given to supply a liberal nutritious diet. Exercises should be carefully carried out, especially valuable being those of the resistant form, the physician or a trained assistant should by example teach the child the various movements. Electricity will assist the gymnastic movements if the faradic current is used. Massage will keep up to some extent the muscle nutrition. The orthopedist must be consulted and deformities corrected in their incipiency.

CHAPTER XXXVII.

DISEASES OF THE BRAIN.

Meningitis.

Pachymeningitis, an inflammation involving the dura mater, is rare in early life. It may occur in connection with injuries of the skull or ear disease, and, in acute cases, usually affects only the external portion of the dura. A more chronic form is seen in connection with hemorrhages on the vertex, when the pia as well as the internal surface of the dura are involved in the inflammation. Such hemorrhages are liable to occur in feeble infants suffering from some exhausting disease. This low grade of meningitis is more apt to be discovered at autopsy than during life.

Acute leptomeningitis, or inflammation of the pia, has already been described in its two most common forms — acute cerebrospinal meningitis and tuberculous meningitis. There is, in addition, a form that may be different in its causative factors from these two varieties, although there is a certain similarity in symptoms.

Etiology.— Instead of the diplococcus intracellularis or the tubercle bacillus acting as a cause, we may have a number of organisms, seen in connection with injuries of the skull, ear disease, or various infectious diseases, producing inflammation of the pia. In these cases it is more distinctly a secondary disease. Any traumatism of the skull from falls or blows, suppuration after cranial operations, disease of the middle or internal ear or mastoids, can afford access to the various forms of streptococci or staphylococci that may attack the pia. It may also be affected by the pneumococcus, the typhoid bacillus, the influenza bacillus and rarely by the Klebs-Loeffler bacillus and the gonococcus. A meningitis may thus be seen in connection with pneumonia, typhoid fever, influenza, scarlet fever, diphtheria, and as a terminal infection in almost any chronic infectious disease.

Symptomatology.— The symptoms of all varieties of meningitis are generally alike, although differing somewhat in the course, rapidity and sequence of the various manifestations. As a secondary condition the symptoms are apt to be masked at first by the course of the original disease. The occurrence of projectile vomiting, convulsions, irregular respiration and pulse, stupor, or coma, will call for a diagnosis of meningitis during the original infection. The symptoms will vary according to the part of the brain involved. Where the inflammation involves principally the convexity, as may be seen in pneumonia or malignant endocarditis, there may be no symptoms besides the stupor to distinguish it from the original infection.

Where the inflammation is at the base of the brain, the cranial nerves are apt to become involved and there will be various paralyses and some retraction of the head. Where the inflammation extends from the middle ear or mastoid, meningitis at the beginning will be unilateral and may continue so during the course of the disease, and facial paralysis may ensue on the affected side in addition to the other symptoms. The meninges over the first and second temporal convolutions are apt to be especially involved in the ear cases. In all varieties, when the meningitis is well under way there will be hyperesthesia of the skin, and there may be local or general convulsions, photophobia, stupor or coma, and irregularities of the pulse and respiration. The temperature is irregular and is influenced by the primary disease. The duration of secondary meningitis is usually short, from a few days to a week, and the prognosis is bad. We have, however, seen a few cases recover where the original disease was controlled and the meningitis apparently not extensive.

Diagnosis.— Lumbar puncture will aid in differentiating the various forms of meningitis by a discovery of the causative organism in the fluid withdrawn. On the clinical side the secondary nature of the meningitis will be shown by its onset during the course of some general infectious disease or when there is a recognized lesion in the ear that is probably being treated. Acute cerebrospinal meningitis is sudden in its onset, without any previous disease, and as the lesion is apt to involve all the surface of the brain as well as the cord, the symptoms are general and severe from the first. Tuberculous meningitis is very slow and irregular in its onset, sometimes taking as long as several weeks to attain its maximum intensity, and the brunt of the lesion is usually at the base of the brain.

Treatment.— The principal effort must be directed toward a free drainage of any localized suppuration in the ear or skull that may be causing the infection. We have seen cases of sinus thrombosis inducing meningitis, both relieved by surgical measures. The general management is the same as in other forms of meningitis. The bowels must be freely opened and bromids given to relieve pain. An ice-bag may be intermittently applied to the head, and, if there is much evidence of intracranial pressure, lumbar puncture may be employed. Small doses of iodid of potash may also be tried. The nourishment must consist of milk, meat broths, or similar easily assimilable foods.

Acute Encephalitis.

This is an inflammation of the brain tissue usually occurring in connection with meningitis from an extension inward of the inflammatory process. The symptoms are largely the same as those caused by inflammation of the pia. They will vary, however, as to whether the convexity or base of the brain is the principal seat of the disease. In the former case there will be convulsions, paralyses, and coma, and in the latter cranial nerve paralyses will form the dominant symptoms. Strümpell describes a hemorrhagic encephalitis occurring in connection with influenza or other infectious disease. It may then be seen without a coexisting meningitis. There is severe pain in the head, followed by stupor and eventually by coma. In other cases there will be great restlessness, alternating with drowsiness. There is apt to be rigidity of the neck; in some cases there may be loss of power in an arm or leg, and in others hemiplegia may ensue. Fever is present and the pulse and respiration are irregular. In mild cases, recovery may occur after one or two remissions, but, in the severer types death usually takes place in coma after an interval of from one to three weeks. The treatment is the same as in meningitis.

Abscess of the Brain.

Cerebral abscess, single or multiple, may occur in early life. The white matter is more apt to undergo suppuration than the gray matter, and hence abscesses form more frequently within than on the surface of the brain. The temporosphenoidal lobes, the frontal lobes, and the cerebellum are most frequently attacked.

Etiology.— Boys are more often affected than girls, and the most frequent cause is ear disease, especially if there is a secondary involvement of the petrous portion of the temporal bone, when the abscess is usually located in the temporosphenoidal lobes or occasionally in the cerebellum. Injuries of the skull due to trauma and sinus thrombosis occurring in connection with such injuries or with ear disease may cause abscess. Infective processes within the nose may spread to the brain and induce an abscess, and rarely septic emboli from pus formations in distant parts of the body may be carried to the brain and produce a similar effect.

Symptomatology.— As the abscesses do not commonly form in the motor area of the brain, the objective symptoms are often very obscure. If, however, the abscess does form or spread into a motor area we will have localized symptoms, the same as seen in the pressure effects from tumors or hemorrhage. The early symptoms are much the same as those of meningitis. There is vomiting, pain in the head, fever, and occasionally localized or unilateral convulsions. The fever is irregular in type and may be accompanied by chills. If these symptoms ensue in connection with acute or chronic disease of the ear, traumatism of the cranial bones, or more distant foci of suppuration that may give off septic emboli, we may suspect cerebral abscess. In case the abscess becomes encapsulated, there may be no symptoms at all, in this respect differing from the disturbing effects of solid tumors. Optic neuritis is occasionally present. Where the abscess is located at the base of the brain, the different cranial nerves may become affected. If the speech centers are involved in the abscess, aphasia may be noted. In some cases the pus may rupture into the ventricles, thereby producing serious and urgent symptoms.

Diagnosis.— It is often impossible to differentiate abscess from meningitis, encephalitis, or tumors of the brain. If, in connection with the symptoms of brain disturbance seen in common with the latter conditions, there is a high irregular fever with chills, and if ear disease or trauma of the skull exists, we may strongly suspect the formation of an abscess. A differential blood count and lumbar puncture may aid in establishing the diagnosis.

Prognosis.— The prognosis is bad, but if the abscess can be located and treated surgically, recovery occasionally takes place.

Treatment.— Any suppurating area involving the ear or bones of the skull must be carefully watched and thorough drainage maintained. If the symptoms point to internal abscess the surgeon must trephine and endeavor to open and drain the abscess. The first and second temporal convolutions are most often the seat of abscess following ear disease. The deeper-seated abscesses may be located by inserting a needle into the part of the brain suspected.

Brain Tumors.

Tuberculous tumors predominate, consisting usually of a caseous tumor of the cerebellum. Gliomata, sarcomata, and cysts occur usually in the cerebellum and pons. Males are more prone than females. Infants under six months very rarely have brain tumors. Tuberculous and sarcomatous growths are secondary to growths elsewhere in the body.

Symptomatology.— The symptoms are produced by pressure, irritation, exudation, or interference with the blood supply and vary also with the location involved.

Headache.— This is persistent and boring in character, causing restlessness, insomnia, rolling of the head, cephalic cry, and photophobia. Occasionally the pain is well localized at the site of the tumor.

Nausea and Vomiting.— This is persistent and without causal relation to food. It is projectile in character.

Vertigo or dizziness are common symptoms, elicited by change of position. The gait may be reeling.

Ocular symptoms are particularly helpful — optic neuritis in one or both eyes is usually present, and especially so when the cerebellum is affected. Optic atrophy may follow and is seen early if the chiasm is involved.

Convulsions occur when the cortex and motor areas are involved. They are general or local in character. Tumors which have not as yet invaded the cortex produce paralysis and later convulsions.

Localization.— Special symptoms will be caused by involvement of areas with known functions, and are not different from those manifested in adults. They will not be enumerated here.

Diagnosis.— From abscess of the brain, tumors may sometimes be distinguished by the absence of local causes, lack of temperature, and the slower course. Septic symptoms, if present, are indicative of abscess, and are confirmed by blood examination. Macewen's sign may be of help if other confirmatory signs are obtained.

Tuberculous tumors occur generally in the cerebellum, and there may be evidences of tuberculous infection elsewhere in the body. Lumbar puncture should always be performed if any doubt remains, as a cell count and chemical analysis may give considerable assistance.

Treatment.— Operative procedures are carried out with great risk in early life even when the conditions for removal of the growth are favorable, but often this is the only hope for relief or cure. The operation of decompression can at least be done to relieve intracranial pressure. Medical treatment should be directed to the relief of urgent symptoms and in the syphilitic cases specific medication should not be delayed.

Infantile Cerebral Palsies.

(*Spastic Diplegia; Paraplegia or Hemiplegia.*)

A paralysis of various parts of the body may occur, due to congenital defects, birth injuries, or hemorrhages in the brain in later infancy or early childhood.

Etiology and Pathology.— We may divide the causes into those operating before birth, during birth, and some time after birth. During intrauterine life the growth of the brain may be arrested by hemorrhage, by lack of cortical development, or by cysts. A condition known as porencephaly may sometimes be present. The exact cause of these accidents or defects is difficult to ascertain or explain. They have been referred to accidents during pregnancy, such as falls or blows on the abdomen, to uremic convulsions, to severe illness in such forms as pneumonia and typhoid fever, and to sudden shocks in women with a neurotic hereditary tendency. The causes operating during birth are due to prolonged pressure on the fetal head in tedious labors or to the unskillful use of the forceps, as already noted in the chapter on Birth Injuries. The hemorrhage is nearly always on the cortex, and may be followed by meningoencephalitis, sclerosis, the formation of cysts, or by atrophy of the underlying tissue. In later months or years, cerebral palsy may follow a severe convulsion or a prolonged paroxysm of whooping-cough, and occasionally certain infectious diseases, such as scarlet fever, small-pox, measles, and typhoid fever, may be responsible for the condition. Direct injury to the skull may also act as a cause. The rupture of cerebral vessels usually takes place on or near the cortex instead of in the lenticular nucleus, as in adults. This has been explained by the delicate, fragile structure of the small blood-vessels on the surface of the brain. Thrombosis and embolism may act as a cause of cerebral palsy in children, but not so frequently as in later years. Rheumatism, valvular disease, or pneumonia favor embolism, while any exhausting condition may lead to thrombosis.

Various changes occasionally take place in the brain following a hemorrhage. Chronic meningitis, sclerosis, softening, or atrophy, with various degrees of secondary degeneration and cysts, may be mentioned in this connection. The following tabular classification of infantile palsies is taken from Sachs and gives an admirable compendium of the subject:

Groups	*Morbid Lesions.*
1. Paralyses of intrauterine onset	Large cerebral defects (porencephaly). Defective development of pyramidal tracts. Agenesis corticalis (highest nerve elements involved).
2. Birth palsies	Meningeal hemorrhage, rarely intracerebral hemorrhage. Later conditions: Meningo-encephalitis chronica, sclerosis, and cysts; partial atrophies.
3. Acute palsies (acquired)	Hemorrhage (meningeal, and rarely intra-cerebral); thrombosis (from syphilitic endarteritis and in marantic conditions); embolism. Later conditions: Atrophy, cysts, and sclerosis (diffuse and lobar). Meningitis chronica. Hydrocephalus (seldom the sole cause). Primary encephalitis; polioencephalitis acute (Strümpell).

Symptomatology.— The form and character of the paralysis depend on the extent and situation of the lesion. A double brain lesion is apt to occur early, either before or during birth. Diplegia or paraplegia may thus result. Hemiplegia is occasionally seen, although not so often, in this early paralysis, and monoplegia is rarely, if ever, encountered at this time. The loss of power is not apt to be complete, and the affected muscles are usually in a spastic condition. Very rarely the muscles may be flaccid. Contractures take place early and give rise to various deformities. The groups of muscles most markedly affected by these contractures are the flexors of the legs and feet and the flexors and pronators of the arms. There is usually a marked exaggeration of the tendon reflexes. Later on there may be athetoid and occasionally choreiform movements in the palsied muscles. Sooner or later other evidences of cerebral defect, besides the paralysis, are apt to manifest themselves. Epilepsy is perhaps the most common of these disturbances. Many cases of epilepsy that are seen in later life have had their origin in some hemorrhage or defect that originally produced a palsy in which recovery may have largely taken place. Another unfortunate sequel in these cases is idiocy of a mild or severe grade. The latter type is more apt to follow the widespread palsies produced by double brain lesions, and shown by diplegia or paraplegia.

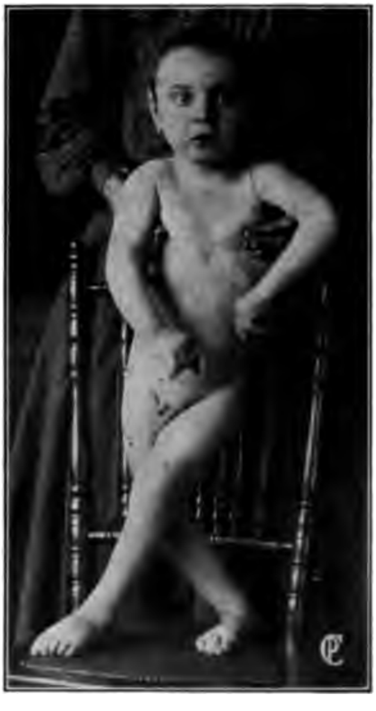

Fig. 144.— Spastic paraplegia: crossed-leg progression.

In cerebral palsy occurring after birth, the onset is usually sudden and the form hemiplegic. It is rare to have both sides of the brain involved, as so often occurs before or during birth. In hemorrhage on the cortex, there is excitation as well as loss of function, and hence convulsions are usually present at the beginning. In later life, when the hemorrhage is usually in the lenticular nucleus, there is loss of function, but little or no excitation. Aphasia will be noted in older children if the speech centers are involved. The paralysis is usually not complete and may be followed by contractures and athetoid movements. While there is not the marked and rapid atrophy seen in spinal affections, there is usually a failure of proper development in the palsied muscles. There is likewise no reaction of regeneration as in spinal paralysis. Considerable recovery of function often takes place, and in some cases the principal disturbance will finally be shown by athetoid or choreic movements rather than by paralysis. Fortunately, mental impairment and epilepsy do not so frequently follow as in the birth palsies. We head in tedious labors or to the unskillful use of the forceps, as already noted in the chapter on Birth Injuries. The hemorrhage is nearly always on the cortex, and may be followed by meningoencephalitis, sclerosis, the formation of cysts, or by atrophy of the underlying tissue. In later months or years, cerebral palsy may follow a severe convulsion or a prolonged paroxysm of whooping-cough, and occasionally certain infectious diseases, such as scarlet fever, small-pox, measles, and typhoid fever, may be responsible for the condition. Direct injury to the skull may also act as a cause. The rupture of cerebral vessels usually takes place on or near the cortex instead of in the lenticular nucleus, as in adults. This has been explained by the delicate, fragile structure of the small blood-vessels on the surface of the brain. Thrombosis and embolism may act as a cause of cerebral palsy in children, but not so frequently as in later years. Rheumatism, valvular disease, or pneumonia favor embolism, while any exhausting condition may lead to thrombosis.

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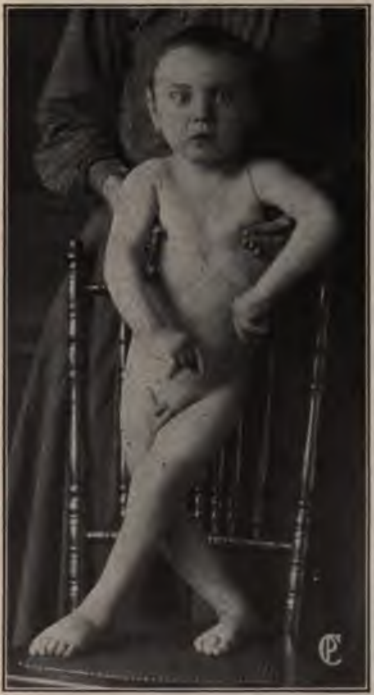

FIG. 144.— Spastic paraplegia: crossed-leg progression.

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Diagnosis.— In well-marked cases it is simple. The relation of the circumference of the head to the chest and the delayed mentality should arouse suspicion. The fluid contains a trace of albumin and sugar. The large head in rickets is square, and other evidences of the disease are found in the osseous system.

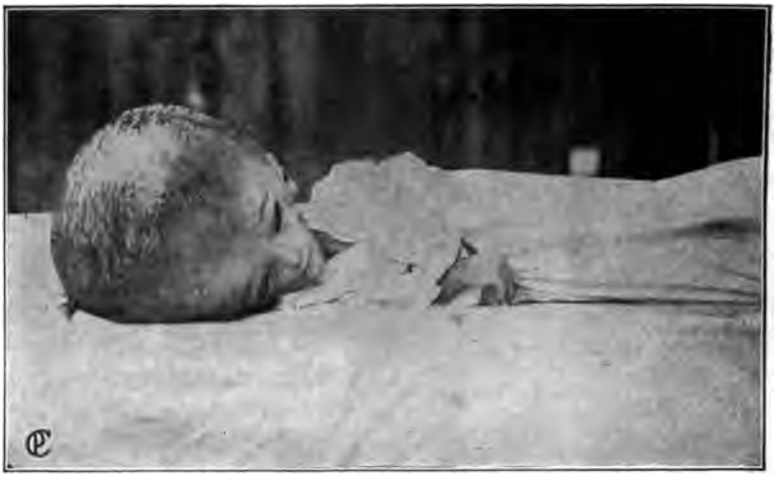

FIG. 146.— Congenital internal hydrocephalus.

Prognosis.— This is directly dependent upon the amount and increase of cranial enlargement as indicated by measurements. As a rule, these children, especially the congenital types, succumb to intercurrent diseases, dying soon after birth or in early childhood. Those cases in which the intellect is not greatly altered may be fairly bright, but their deformity and peculiar gait necessitates special school facilities. A certain number live to be bright and useful members of society.

Treatment.— Medicinal treatment is of little avail. Those with a syphilitic history should be given the benefit of the mercury and iodids. Surgical treatment of all sorts has been advised and soon abandoned, because of the poor results obtained. Pressure bandages, puncture of the ventricle, injections and insufflations into the ventricles, permanent drainage from the ventricles into the subdural space, are among the various means which have been tried at the Post-Graduate Hospital, and each has been disappointing. Lumbar puncture, or aspiration of the ventricles for the relief of pressure symptoms, is the only procedure which sometimes gives good results, and in some instances these repeated punctures have effected a cure in selected cases.

Microcephalus.

By microcephalus we understand that condition in which there is arrested or defective development of the brain with a correspondingly small cranial cavity.

Microcephalus probably originates during fetal life or soon after birth. The fontanels are closed and premature ossification of all the sutures takes place. The vertex is, as a rule, dome-shaped, although it may be asymmetrical with a sharply receding forehead. When the condition begins later in infancy, it is considered to be the result of minute hemorrhages into the cortex arising from a meningeal disease or an eclamptic seizure.

The diagnosis of this form of idiocy is made upon the abnormality of the head. The measurements are taken of the head, chest, and length of the infant, and the relations compared to those of the normal infant of corresponding age (see chapter on Development). The symptoms do not differ from those of idiocy or imbecility, as described on page 498. The operative treatment of craniotomy which was formerly advanced for these cases we have entirely abandoned as giving no results.

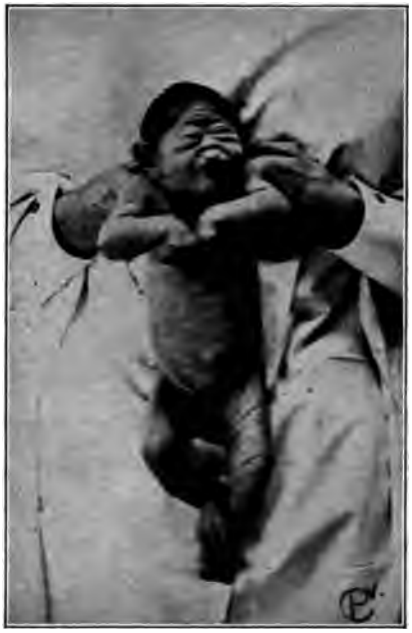

FIG. 147.— Microcephalus, with double hare-lip.

Idiocy, Imbecility, Feeble-mindedness.

Idiocy may be divided into three groups: the prenatal, the acquired, and the myxedematous. In each of these the undeveloped intellect has been more or less permanently impaired. Minor degress of idiocy are designated as imbecility or feeble-mindedness; the mental impairment being dependent upon the extent of the cerebral lesion.

Etiology.— The children of insane parents or of those who have been the victims of alcoholism, epilepsy, hysteria, chorea, or syphilis, may be born idiotic. Consanguineous marriages, especially among those who have suffered from some neurotic disease, may produce idiotic children. The acquired types are generally the result of injuries received at the time of birth and from convulsions, both of which result in the rupture of delicate blood-vessels, with later sclerotic changes. This latter change may also take place after attacks of inflammation of the brain or its meninges. The relation of idiocy to hydrocephalus and epilepsy has been considered elsewhere.

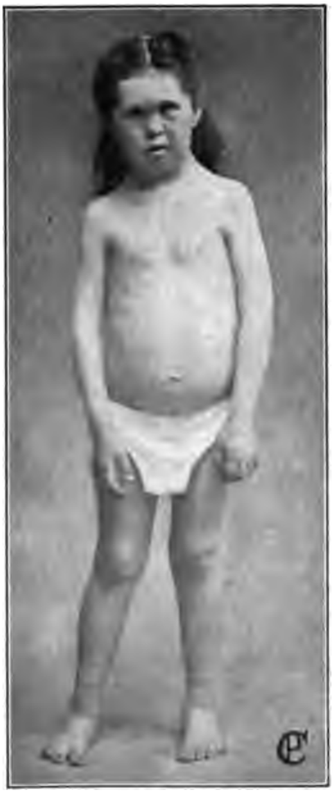

FIG. 118.—Imbecile with marked strabismus.

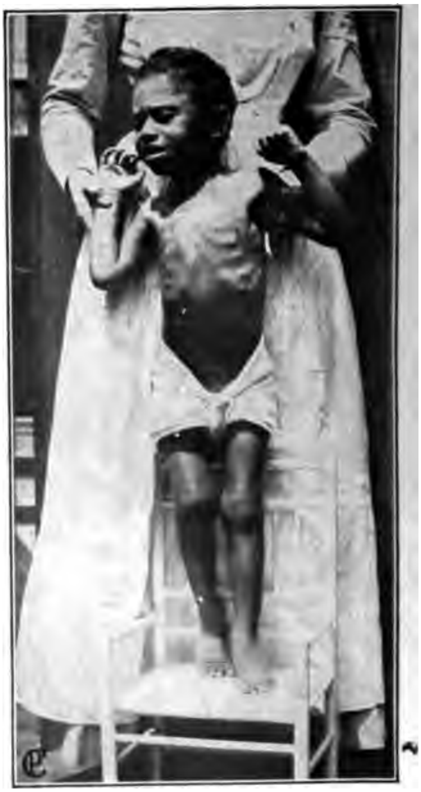

FIG. 119.—Idiocy, with blindness.

Symptomatology.— From the physical standpoint an idiot may resemble a normal child. He radically differs, however, in his powers of cerebration. He is unable to acquire any conceptions and he has no sense of fear. As a rule, the diagnosis can be made by observation alone. The expression is vacant and the eyes are continually roving from place to place. In younger children saliva dribbles over the chin. The teeth may be irregularly erupted and usually are sharp and carious. Other stigmata of degeneration may be seen. The child cannot distinguish its parents, it has no acquired speech, but makes unintelligible animal sounds, it becomes irritated or laughs without provocation, and when awake keeps in constant motion.

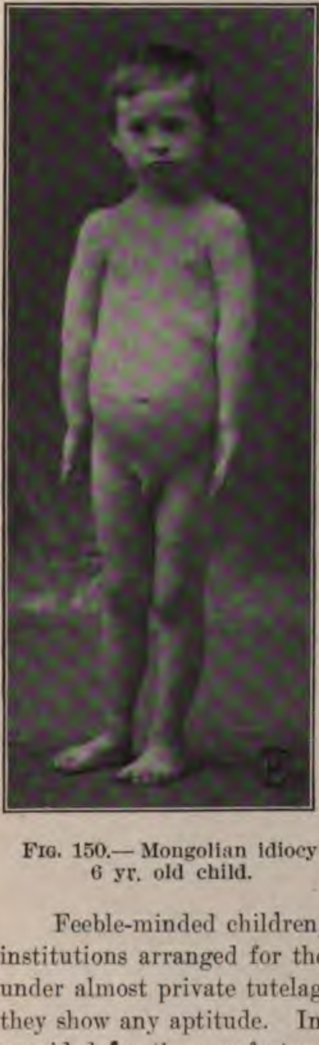

FIG. 150.— Mongolian idiocy: 6 yr. old child.

There are no habits of cleanliness. Food is eaten ravenously and not selected with any relation to taste or desire. Imbeciles and feeble-minded children differ from idiots in that they may be able to recognize their parents and appreciate some simple objects, as toys. A few words may be learned and habits of personal cleanliness may after a time be acquired.

Prognosis.— The prognosis for the idiotic child is invariably bad. The feeble-minded are capable of some degree of development when placed under special tuition.

Treatment.— The parents of idiots should be advised that an institution is the proper place for their afflicted child, especially if there are other children in the family. Here he will be unmolested and allowed more freedom than is possible when in his home.

Feeble-minded children, if the circumstances permit, may be placed in institutions arranged for the care and training of mental defectives, where under almost private tutelage they may be trained along the lines in which they show any aptitude. In some of our States such institutions have been provided for these unfortunates, so that even the children of the poor may receive this beneficial training.

Mongolian Idiocy.

This form of idiocy, because of several simulating features, is often mistaken for cretinism. The resemblance to cretinism is seen in their stunted development, in the large and often protruded tongue, the thickened lips, and open mouth. A Mongolian idiot, however, may, even in infancy, be distinguished by the peculiar expression of the face, which, when analyzed, is seen to result from slanting eyelids like those seen in the Mongolian race. Although the eyes converge, they are relatively further apart than in the normal, the nose is small and flat, and the contour of the head is distinctly rounded. The skin in the early months is not harsh and dry; it may be soft and velvety. A rather characteristic feature is seen in the flabby muscles and mobility of the joints, which allow the thighs, for example, to be flexed with extraordinary ease upon the body. The head is not held erect until the age is well advanced, the fontanels remain open late, and the nutrition is impoverished in spite of good feeding. The bones of the hands and wrists show deviations from the normal, which are best seen in a radiograph, although the incurvation of the little finger and the short second phalanx is often easily discernible.

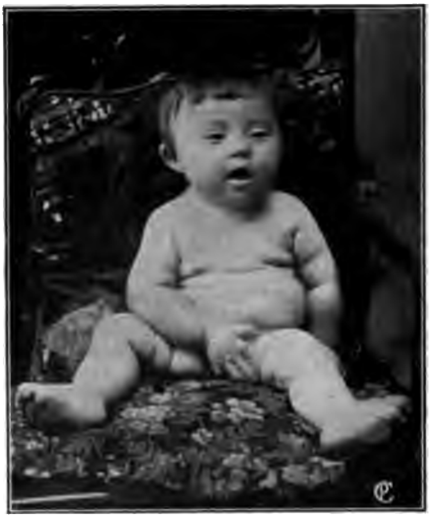

FIG. 151.— Mongolian idiocy in infancy.

The mongoloid idiots further differ from the cretins in that they are not influenced by thyroid therapy, and if they pass through the period of infancy they may show some degree of intelligence. Their memory is good and many have a liking for music. Special pedagogic procedures are therefore indicated to prompt further development. Before receiving any instruction the vision should be corrected, as almost invariably the eyes are found to be defective.

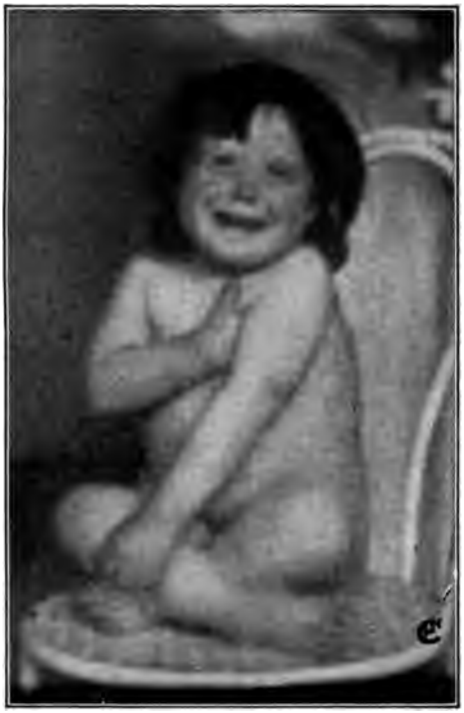

FIG. 152.— Idiocy.

Amaurotic Family Idiocy.

This is a disease occurring in Hebrew families and dependent upon arrested cerebral development and characterized by blindness and changes in the region of the macula lutea.

Tay, an oculist, first described the ocular symptoms, while Sachs, in this country, further elaborated the clinical and pathological picture.

Etiology.— The causes of this disease are still undetermined. More than one case may occur in the same family, and nearly all the cases thus far observed have been among Hebrews.

Symptomatology.— The first symptoms appear about the sixth month. Up to this time the child may have been considered healthy and robust. The first symptoms noted are that the child makes no effort to hold up its head, moves its limbs only slightly, and takes no interest in those about him. If some degree of nystagmus is present the fact that the child is blind escapes the attention of the parents or even of the physician. If seated the head falls back and the lower extremities give evidences of complete paralysis. Later in the disease spasticity occurs in these extremities with increase of the reflexes. As the disease advances the weakness becomes intensified, and usually after the first year there is total blindness and evidences appear of mental deficiency. Strabismus is occasionally observed and is usually associated with the nystagmus. Convulsions are rare. The hearing may be abnormally acute, the infant being startled from its apathy, for example, by clapping the hands. Ophthalmoscopic examination fixes the diagnosis when Tay-Kingdon's cherry-red spots on a white background is found in the region of the macula lutea. Subsequently, optic nerve atrophy results. Before the fatal ending emaciation and other subjective and objective symptoms of marasmus appear. The prognosis is invariably bad, the children rarely living beyond the second year.

Treatment.— Beyond giving the prognosis as to the duration of life, we are powerless to give aid in this disease.

Modified Binet-Simon Tests for Mental Deficiency.

These tests, while not ideal, make a very satisfactory approximation of the mental age of the child. The examiner should put the child at ease and be certain that the English language is understood.

MENTAL TESTS.

Arranged for the early months of life when the determination of minor degrees of deficiency is more difficult.

Six Months.

1. Child sits alone. Should sit unsupported for 2-3 minutes. Will sit up indefinitely with some support at back.
2. Child balances head.
3. Turns head in direction of unexpected sound.
4. Eye will follow a bright object, such as a red ball or other attractive object.
5. Child will seize an object and hold it. Thumb coordination should be noticed at this age.

Nine Months.

1. Child sits unsupported indefinitely.
2. Child plays with toes and hands. Will grasp for attractive objects.
3. Child can draw itself into sitting position with slight assistance and attempt to stand.
4. See if child can transfer object from one hand to another.
5. Child holds cup or nursing bottle.

One Year.

1. Sits and stands unsupported.
2. Use of pencil. Marks back and forth on paper with pencil. Place the pencil in child's hand and he will imitate the movement though effort is crude.
3. Child will imitate a few sounds though does not talk at this age. Try such sounds as mamm-mam - -da-da or have mother do so.
4. Child will imitate play with toys. Use a bell, a rattle, or place a ball in a box, etc.
5. Child begins to show a preference for toys.

Eighteen Months.

1. Stands and walks unsupported. Runs.
2. Begins to recognize common objects and animals in pictures. Will point to them when directed, but does not enumerate.
3. Recognizes "baby" in mirror in a few seconds. Place the mirror in front of the baby and hold it there. Child recognizes it is "baby."
4. Child says a few words such as mama, papa, baby. Will imitate a few simple movements such as clapping hands, or placing hands on head or ears.
5. Child will unwrap a piece of candy. Let the child see you wrap the candy in paper and he will unwrap it.

Two Years.

1. Child will point out simple objects in a picture and name them.
2. Use of pencil. Child will mark back and forth on paper imitating the examiner. Will also use rotary movement.
3. Obeys simple commands. Such as "Throw me the ball." "Give the ball to mama." "Give me the pencil." and similar ones.
4. Imitation of simple movements. Hold arms up high, palms on head, put ball on head, etc. Should imitate three out of five.
5. Knows features. Will find them on doll or mamma when unwilling to do so on self.

Two and One-Half Years.

1. Will talk in short sentences.
2. Imitation better than at two.
3. Copy a circle. Effort fairly good.

4. Recognizes self in mirror in 2–3 seconds. Place the mirror in front of child and remove quickly. Child will name the picture for self at this age instead of calling it baby.

5. Repeat two numerals. Show picture containing group of two or any other group of two, and child will repeat the two numerals after the examiner.

THREE YEARS.

1. Enumerate objects in a complex picture and can tell something about it. Shows some imagination.
2. Repeat sentences containing six syllables.
3. Repeat two or three numerals. 24. 246.
4. Knows family name.
5. Will untie bow-knot and investigate parcel when the object has been tied before the child.

IDIOTS.

MENTAL AGE 1 AND 2 YEARS.

1. Move lighted match slowing before child's eyes.
(Full credit given if eyes follow light for briefest period.)

2. Place a wooden block in child's hand.
(Credit given if block is grasped.)

3. Show the wooden block without touching child with it and say, "This is for you, don't you want to play with it?"
(Credit given if child takes it.)

4. Offer child a piece of wood and a piece of chocolate the same size.
(Credit given if he eats the chocolate and does not attempt to eat the wood.)

5. Show child a piece of chocolate, then wrap it in paper and present it to him, telling him to eat it.
(Credit given if he removes the paper before eating.)

6. Make simple movements, clapping the hands, sitting down, standing up, etc.. and tell the child to do the same.
(Credit given if one intention is accomplished.

IMBECILES.

MENTAL AGE 3 YEARS.

7. Show me your nose. Show me your eyes. Show me your mouth.

8. Listen well and repeat what I say. 4; 3-7; 6-4; 5-8. Pronounce numbers slowly and distinctly with one-half second interval between, one pair at a time.

(Full credit given for one exact repetition.)

9. Place picture before child and ask, "What is that?" or "What do you see there?"

(Full credit given if some objects are enumerated.)

10. "What is your name?" If first name is given — "And your other name?"
(Surname required.)

11. Listen well and repeat what I say: "I am cold and hungry."
(No errors of any kind allowed.)

MENTAL AGE 4 YEARS.

12. "Are you a little boy or a little girl?" If necessary — "Are you a little girl?" "Are you a little boy?"

13. Show child a penknife, saying, "What is that?" "What is it called?" Then show penny, and finally key, asking same questions.

13. (Names of three objects required.

14. "Listen well and repeat what I say: 4-9-2; 3-7-4; 5-8-1."
(Full credit given for one exact repetition.)

15. "You see these two lines. Tell me which is the longer."

MENTAL AGE 5 YEARS.

16. Place two boxes, weighing 3 and 12 grams respectively, on the table before the child, leaving a space of 5 or 6 centimeters between them and say, "You see these two boxes? Tell me which is the heavier?" Repeat, using boxes weighing 6 and 15 grams, and repeat again, using first pair.
(If there is still doubt about the child's ability to compare weights, repeat process.)

17. Draw a square, 3 to 4 centimeters in diameter, with ink and ask the child to copy it, giving him pen and ink to do so.

18. "Listen well and repeat what I say: My name is Charley. O! the naughty dog."

19. Place four pennies in a row before the child, and say: "Do you see these pennies? Count them and tell me how many there are."
(Child is required to point to each with finger, no error allowed.)

20. Place an oblong card on the table before the child, and place also, nearer to the child, two triangular cards formed by cutting another card like the first one, in two, along a diagonal. Place these two triangular cards in such position that their hypothenuses

form a right angle, one with the other, and say to the child: "Put these two pieces together so that they will form one card like this" (indicating the oblong card). If the child turns over one triangular piece without noticing it, it is permissible to begin again.

Mental Age 6 Years.

21. "Is it morning now?" "Is it afternoon?"

22. "What is a fork?" "What is a table?" "What is a chair?" "What is a horse?" What is a Mamma?"
(If some use of three of the objects is mentioned, the response is considered correct.)

23. Draw a diamond figure with ink and ask the child to copy it, giving him pen and ink for the purpose.

24. Place 13 pennies in a row on the table before the child, and say: "Count these pennies for me, pointing to each one as you count it."

25. Show pictures of faces. "Which is the prettier of these two faces?"
(No error allowed.)

Mental Age 7 Years.

26. "Show me your right hand." "Show me your left ear."
(No error allowed.)

27. Show pictures as in Test 9, requiring descriptions.

28. "Take this key and put it on that chair, bring me that book lying on the table, and open the door."
(Repeat these directions distinctly twice.)

29. Place three two-cent and three one-cent stamps on the table before the child. Be sure that he knows the 2's from the 1's, and then ask him to count how much they would all cost.

30. Have 4 pieces of colored paper, red, blue, yellow and green. Point to each, asking, "What is this color?"
(No error allowed.)

MORONS.

Mental Age 8 Years.

31. (a) "Do you know what paper is?" "Do you know what cardboard is?" "Are they alike?" "In what way are they not alike?"
(b) "Have you ever seen a fly?" "Have you ever seen a butterfly?" "Are they alike?" "In what way are they not alike?"
(c) "Do you know wood when you see it?" "Do you know glass when you see it?" "Are they alike?" "In what way are they not alike?"
(Two satisfactory answers required).

32. "I want you to count backward from 20 to 0. Like this — 20-19-18."
(This must be accomplished in 20 seconds; one error allowed.

33. Four pictures are shown, one at a time, and the question asked with each. "What is missing in this picture?"
(Three correct replies required.)

34. "What is to-day?" "What date is it?"

35. "Listen well and repeat what I say: 3-8-5-7-1; 9-2-7-3-6; and 5-1-8-3-9."
(One group given at a time. One exact response required.)

Mental Age 9 Years.

36. In a pile before the child place the following coins: Ten pennies, two nickels, two dimes, one quarter, one half dollar. Then propose a game of storekeeping, the child to keep the store and use the pile of money to make change, the experimenter to be the customer. Add some articles for sale. Then buy something for four cents. Give the child a quarter and require the change.

37. Test No. 22. Definitions superior to use are required.

38. Show the child successively a penny, a dime, a dollar, a quarter, a nickel, a half dollar, a two dollar bill, a ten dollar bill, a five dollar bill. Ask "What is this?" with each.

39. Name the months of the year in order.
(One error allowed. Time 15 seconds.)

40. (a) "If you were going away and missed your train what would you do?"
(b) "If one of the boys should hit you without meaning to, what would you do about it?"
(c) "If you broke something belonging to some one else, what would you do about it?"
(Two good responses required.)

SECTION XIV.

CONGENITAL MALFORMATIONS AND DEFORMITIES.

CHAPTER XXXVIII.

CONGENITAL MALFORMATIONS AND DEFORMITIES.

A careful examination should always be made of the newly-born child. Any deviation from the normal condition may be due to prenatal malformations, foetal inflammations, or to injuries received during the process of birth.

Tongue-Tie.

A short frenum causes this deformity. The tip of the tongue is depressed and fixed in the floor of the mouth so that often it cannot be normally protruded. Sucking and articulation are difficult, and when allowed to persist there is often a lisp in the speech.

The treatment is surgical, and consists in dividing the frenum with blunt scissors and stripping back the divided tissue. Parents often incorrectly attribute backwardness in talking to a possible tongue-tie. Mental defects or deafness may instead be found as the real cause if the child is much beyond the age when it should be talking.

Harelip.

When the central process fails to fuse with the lateral processes which go to make up the upper half of the face in fetal life, a condition known as harelip results. This may be unilateral or bilateral, the fissure varying in extent from a slight cleft to a fissure extending through the entire length of the lip into the nasal fossa. A cleft palate may also be present.

The treatment is surgical, and should be undertaken as soon as possible after the child is well started in its feeding — three months of age being the time selected by the majority of surgeons. Nursing is sometimes impossible, but the maternal milk should be pumped out and fed by the dropper or the Breck feeder (see Fig. 2). A nipple shield can sometimes be used to advantage, or the milk can be fed from a nursing bottle when the babe cannot suckle the mother's breast. Nursing should not be discontinued except for exceptionally good reasons.

Cleft Palate.

In this condition a fissure is seen in the roof of the mouth, involving the soft palate, the hard palate, or both.

It occurs when the palatal arches in fetal life fail to fuse. Cleft palate often occurs with harelip, particularly when the latter condition is double.

Owing to the gap in the mouth the infant usually cannot nurse nor feed from a bottle, and it is often necessary to resort to feeding with a dropper or by gavage. Nipples with a flexible wing have been devised to accommodate these cases for bottle feeding, the flap being so arranged that it fits snugly to the upper lip and covering the cleft.

Such deformities as cleft palate and harelip make feeding very difficult, and these cases frequently die of inanition, unless carefully handled.

The treatment is surgical; the operation should be performed as early as possible. The surgeon who is to operate must decide upon the preferred age, which depends upon the character of the operation and the nutrition of the child. Some surgeons operate at the end of the second year, while others prefer to wait until the arches are well developed.

Congenital Branchial Cysts.

Certain tumors of the neck in infants and young children have their origin in an incomplete closure of one of the branchial clefts. Early in the fetal life of the vertebrata there appears under the projecting frontal process a series of four plates, bounding the cavity of the pharynx on the side. These plates unite to form four parallel arches separated by transverse clefts. The branchial clefts unite, and by a process of morphological change form various structures of the neck. If this regular process of development is interfered with from any cause, various abnormalities may result, as a condition intended to be merely temporary remains more or less permanent. Hence, according to the various grades of arrested development, we may have marked deformities, branchial cysts, or the remains of fetal epithelial tissue destined to proliferate at a later day and form a cyst. There likewise may result fistulous tracts from non-union of the branchial clefts, particularly from the lowest one. These have been divided into: (a) complete branchial fistulæ, open the whole length of the tract; (b) fistulæ having only an external orifice and ending in a cul-de-sac, which is the commonest form; (c) fistulæ with only an internal orifice. More frequently the branchial tract is closed at both the pharyngeal and cutaneous ends, and a cyst is formed between.

Senn has made the following classification according to the cystic contents: 1. Mucous branchial cysts, due to imperfect closure of the upper portion of the branchial tract with retention of its physiological secretion. 2. Atheromatous branchial cysts, usually located in the second and third branchial tracts in the region of the hyoid bone. 3. Serous branchial cysts, having a thin-walled capsule lined with pavement epithelium, and following the defective obliteration of any of the branchial clefts. 4. Hemato-cysts of branchial clefts, in which the serous fluid of the cyst has been discolored by hemorrhages into the sac.

The contents of these cysts are always such as may be produced by some kind of epithelium, and in this they differ from true dermoid cysts that may contain the secretion of the various glands and appendages of the skin.

Treatment.— The object of treatment in these cases is, of course, to radically destroy the membrane that secretes the serous contents of the tumor. In structure, the cyst consists of a thin capsule of connective tissue, lined on its inner surface by a matrix of epithelial cells, which must be destroyed by an inflammation set up in the sac or removed by the knife, before recovery can take place. As these cysts may be connected with the sheath of the deep cervical vessels, complete removal by operation may be attended by severe hemorrhage unless very great care is exercised. When fistulæ exist they may sometimes be destroyed by passing in a probe which has been dipped in a 10 per cent. nitrate of silver solution. If excision of the cyst is not feasible it may be opened and packed with gauze.

Malformations of the Esophagus.

This malformation is quite rare. The diagnosis is generally made probable by the inability of the infant to take or retain any feedings, or the return of such feedings through the mouth, nose or fistulous tracts. The stomach-tube cannot be passed at all or meets an obstruction or stricture.

Various degrees of malformation occur, such as narrowing in its entire length, leaving only a band-like process, openings into the trachea or externally into the neck. Blind pouches also have been found.

Treatment.—Skilled surgical treatment may avail in the minor degrees of malformation, but the early age and severity of the operative work mitigate against success where prolonged procedures are necessary.

Malformations of the Rectum and Anus.

A stenosis of the anus may be present, due to abnormal encroachment of the skin upon the anal mucocutaneous tissue. The rectum itself may be congenitally too narrow.

The treatment of both these conditions is mechanical dilatation with the fingers or a bougie.

The anus may be imperforate, due to non-absorption of the cutaneous envelope, the integrity of the rectum being normal. Treatment of the abnormality is by incision and removal of the obstructing tissue.

There may be an obstruction in the rectum, the anal structure being normal; that is, the large intestine may terminate in a blind sac having no communication with the anus, or it may have a small fistulous connection. Occasionally there is a membranous velum with a very small aperture across the rectum. The treatment is surgical. Careful inspection and examination of the newly-born by the attendant will reveal the deformity, and immediate steps should be taken to obtain surgical correction.

The time of the passage of the first stool and its size and character should always be investigated by the attending physician. Minor degrees of stenosis of the rectum or anus are not infrequent in the newly born. Although the thin feces of infancy may escape without difficulty, when the child grows older and the excreta becomes more solid, stenosis may occasion much inconvenience.

Hypospadias.

The anomaly in male genital organs in which the urethra opens on the under surface of the penis instead of at the point of the glans, is known as hypospadias. This exit may be located at any point on the penis from tip to base, and is designated according to location, as glandular, penile, peniscrotal, or perineal. In the perineal type, hermaphrodism may be suspected, as the testicles are often undescended, the penis rudimentary, and the scrotum divided by a deep fissure.

The passage of urine is usually difficult. Dripping of urine from an overdistended bladder is the cause of incontinence in these cases. The treatment of hypospadias is surgical and often is tedious, but experienced operators now obtain very satisfactory results with flap-method operations.

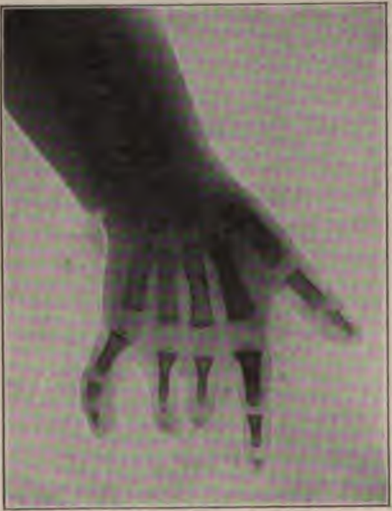

FIG. 153.— Congenital deformity of the hand.

Extrophy (Ectopia) of the Bladder.

This deformity is characterized by Ahlfeld as " a fissure in the abdomen of an otherwise well-formed fetus, which is lined with a bright red, velvet-like skin (the bladder membrane), and which is constantly kept moist by the urine which trickles upon it. Below the fissure, in the abdomen and bladder, are to be seen incompletely developed external genitals."

The only treatment is plastic surgery, and the results are often quite brilliant, although several operations are usually necessary before a satisfactory repair is made.

Congenital Dislocation of the Hip.

The cause of this deformity is not known, but some cases are doubtless due to fibroid tumors in the maternal uterine wall producing a malposition *in utero*. Lange distinguishes three forms: the supracotyloid, the supracotyloid and iliac, and the iliac.

The condition is rarely noted in early infancy, as the symptoms are not in evidence until the patient begins to walk. The leg is shortened and flexed on the pelvis, and when the dislocation is bilateral there is a considerable lordosis present when the patient stands erect. If the dislocation be unilateral a scoliosis results. A peculiar waddling gait is quite characteristic of these cases. When there is much contraction of the adductors the lower ends of the femurs cross each other, forming the scissor-leg deformity. This, however, is rare. A Roentgenogram will clear up any question as to the diagnosis. A reduction of the dislocation is more readily made when the patients have not done much walking, as owing to the shallow acetabulum it is impossible to keep the femoral head in place unless the patient remains in bed.

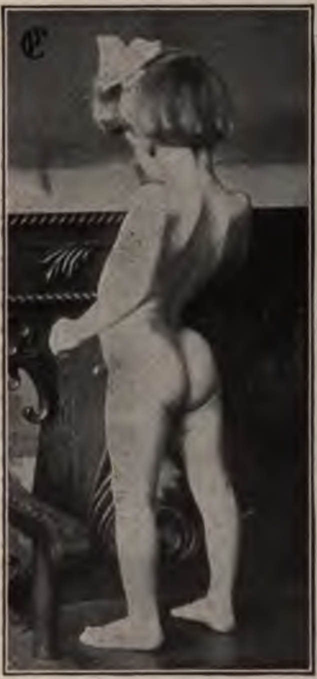

FIG. 154.—Double congenital dislocation of the hip.

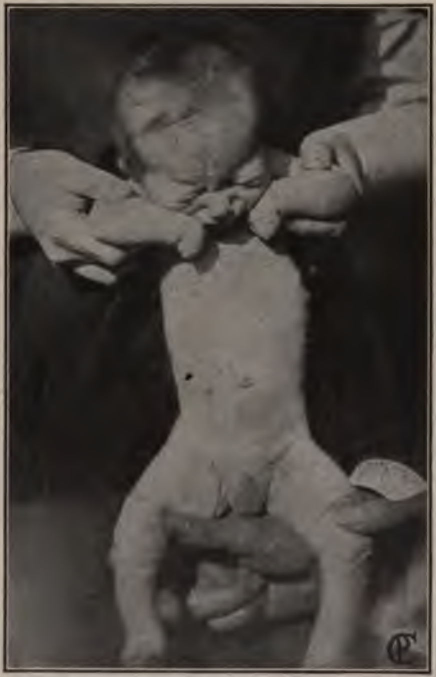

FIG. 155.—Intra-uterine amputation of the hands.

Treatment.—The bloodless reduction method advocated by Lorenz is usually selected by the surgeon as offering the best results. A plaster dressing is applied which must be worn for months, and later massage and exercises are ordered. This operation should not be delayed too long, as in older children good results are rarely secured.

Congenital Absence of the Bones.

Among the rarer bony deformities there is occasionally seen an absence of the radius. This is a bilateral defect, and produces a serious incapacity in the physical strength and ability of the extremity affected. An incurvation due to abnormal muscular attachments results, as illustrated in the radiograph (Fig. 156).

Fig. 154 is a radiograph showing absence of the greater portion of the phalanges.

Fig. 155 shows an absence of the hands beyond the carpals as a result of intrauterine amputation.

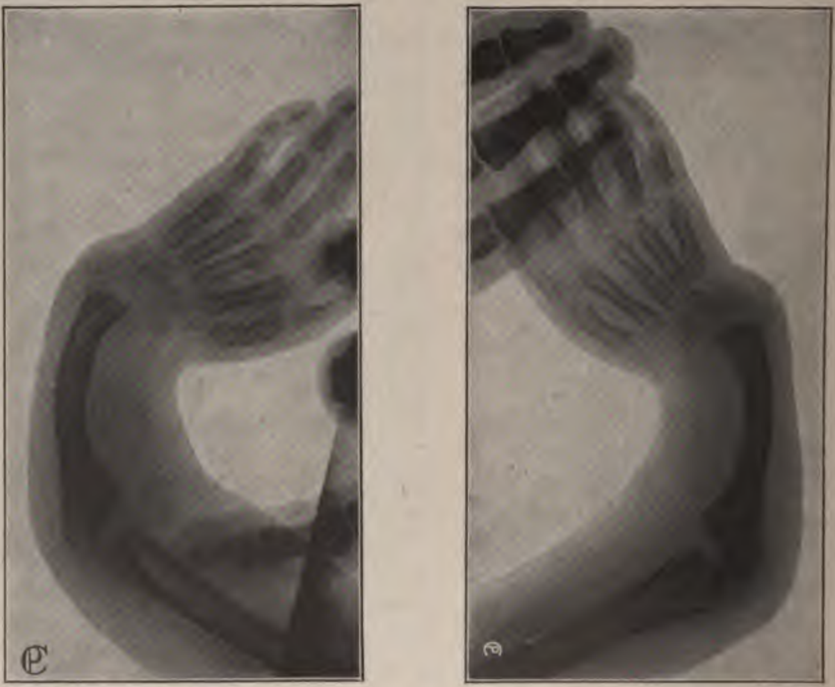

FIG. 156.—Congenital absence of the radius.

Talipes.

(*Club-foot.*)

Congenital talipes results from malformation or lack of development of the bones about the ankle. A small uterus with deficient liquor amnii may produce a talipes by abnormally compressing the parts, the normal position of the feet *in utero* being a talipes varus.

All acquired talipes are due to pathological conditions; for example, following anterior poliomyelitis or contractions of tissues after extensive burns or diffuse suppurations, and as the result of the overaction of certain muscle groups when the nerve trunk supplying their equilibrants is affected.

In fact, any process which will change the normal equilibrium of muscle groups about the ankle will produce a talipes. The cause may be found in the bony or ligamentous structures or in the muscles.

Talipes varus is the most frequent variety seen in congenital cases. In this form the patient walks on the outer surface of the ankle, the inner surface of the foot being raised.

Talipes equinus results when the heel is elevated and the patient walks on his toes. This form results from paralysis of the extensor muscles of the leg, with secondary contractions of the muscles of the calf, and occurs following anterior poliomyelitis or injuries to the anterior tibial nerve.

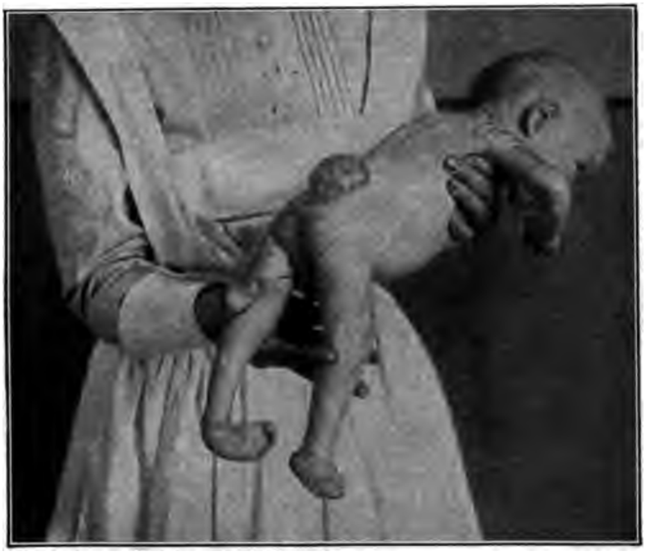

FIG. 157.— Congenital club feet in an infant with a spina bifida.

In talipes valgus the patient walks on the inner surface of the ankle, the outer border of the foot being raised and everted. A paralysis of the tibial muscles produces this deformity.

Talipes calcaneous is rare; the patient walks on his heel with the toes elevated. This deformity arises when the calf muscles are paralyzed.

Treatment.— In congenital cases daily manipulation of the foot and ankle should be instituted at once until the deformity is overcorrected, the foot being retained in good position by mechanical means such as a cast or apparatus.

In paralytic cases manipulation and massage is indicated, special attention being given to the weakened muscle groups, toning them up by the use of faradism and friction. A proper splint should be applied to retain the foot and ankle in the correct position. Tenotomy and other operative measures may be necessary in neglected cases.

Webbed Fingers and Toes.

(*Syndactylism.*)

In this condition two or more fingers or toes are joined laterally by a web, which, if thin, consists mainly of skin, but if thick more or less fleshy tissue is present. If the fingers be affected, the web must be divided, care being taken to insure full separation to the base of the fingers and the separation maintained. If the web be thin the operation consists in incision only; but if the web be fleshy, skin flaps must be made and the denuded surfaces covered. Webbed toes need not to be treated unless for the cosmetic effect.

Meningocele and Encephalocele.

Owing to a congenital opening at some part of the skull, a portion of the cranial contents may protrude. The defect is most common in the occipital bone, in any portion of which the defect may be present, from the peripheral part to the center. If it exists in the anterior portion of the bone, it may extend to the posterior fontanel; if in the back part, it may connect with the foramen magnum. The size of the tumor depends, of course, upon the extent of the opening in the bone. Similar defects may also be present in the nasofrontal region, and less frequently in the basilar, temporal, and parietal segments of the skull. The openings may contain meninges alone, meninges with brain matter, or the latter with fluid in the interior; in the latter event the anomaly is termed hydrencephalocele. The tumors appear at or soon after birth.

A meningocele is usually small, with little tendency to increase in size. It may be more or less pedunculated; it presents fluctuation, but no pulsation, and is usually reducible.

In encephalocele there is distinct pulsation, and efforts at compression will be accompanied with evidences of marked cerebral irritation. The tumor, though not large, has a wide base, and is partly reducible.

A hydrencephalocele is apt to be large, lobulated, with sometimes a distinct peduncle. Pulsation is usually absent in the tumor, which, however, is fluctuating and mostly translucent. Compression is not apt to be successful in reducing the tumor. Sometimes there is more brain substance in the tumor than in the cranial cavity, and the infant is then microcephalic.

Prognosis.— The prognosis in hydrencephalocele is bad, as the tumor usually grows rapidly, and there may be rupture, with immediate death.

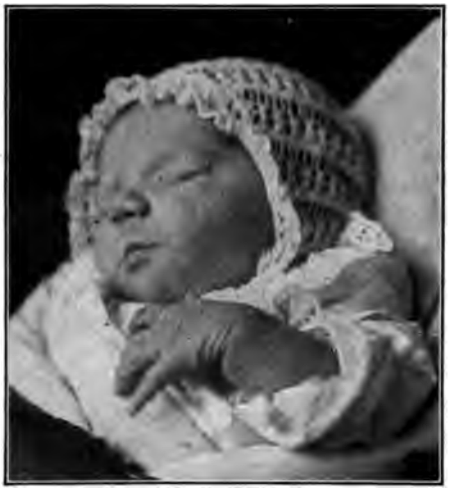

Fig. 158.— Webbed fingers.

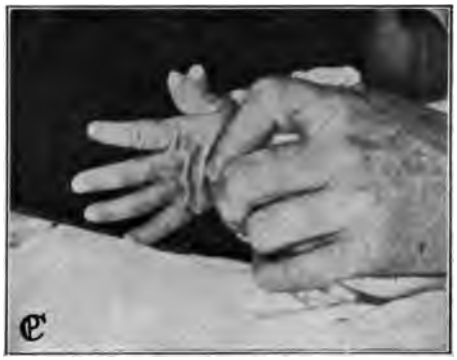

Fig. 159.— Supernumerary thumb.

In meningocele and encephalocele the prognosis is better, especially if the tumor be small.

Treatment.— Treatment in these cases is of little avail, although the withdrawal of fluid and even stimulating injections have been tried.

Spina Bifida.

Owing to congenital failure in the development of the vertebral arch, one or more of the laminæ may be absent, with resulting protrusion of the spinal meninges. The lumbar region of the spinal column is the part usually affected. Occasionally, however, we have meningocele or encephalocele. The tumor is round, fluctuating, and by compression the cerebrospinal fluid can be forced back into the spinal canal. Too severe pressure, however, may produce eclampsia or other grave cerebral symptoms. The base of the tumor depends upon the size of the opening, being pedunculated if it is small, but more sessile if large. The tumor is usually covered with skin, which, however, may be absent, exposing the dura mater. If there is not much tissue covering the tumor, transudation may occur through the walls or rupture of the sac may take place if growth is rapid. Some portion of the lower segment of the cord or the cauda equina is apt to be imprisoned in the sac. The extent of the involvement of nerve-tissue can be measured by the paraplegia or other evidences of lesion in the spinal cord and nerves.

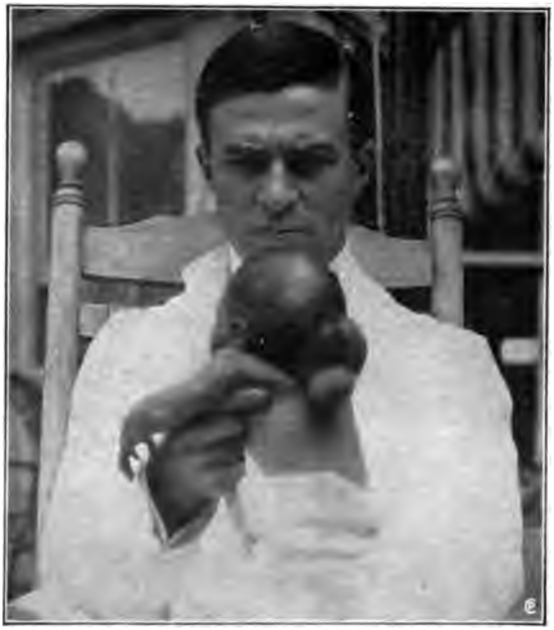

FIG. 160.— Meningocele.

Gradual absorption of the fluid may occur, and the child may grow up with little inconvenience from the shrivelled tumor. This, of course, takes place only when the nerves are not involved. In most cases there is a gradual increase in the size of the tumor, with final ulceration or rupture, followed by convulsions or coma and death. The fatal ending may also come with a gradual emaciation accompanying paraplegia.

Treatment.— The treatment of small tumors consists in the application of a soft compress to avoid friction and to support the parts. When the tumor is growing, however, more energetic measures may be tried. The simplest procedure is to withdraw the fluid by aspiration, and follow this with gentle but constant pressure. The fluid must be slowly and cautiously removed, for fear of active nervous disturbance and even eclampsia. Injections with iodin of various strengths have been tried, but without much success. In some cases the tumor can be surgically removed by completely excising the sac. This may be successfully accomplished in the pedunculated variety where the opening in the lamina is small. It should never be attempted if there is evidence that the cord or cauda equina may be involved in the tumor. Radiographic examination should be made in all cases in which it is proposed to do surgical work, as in this way the operative cases often can be separated from the non-operative variety.

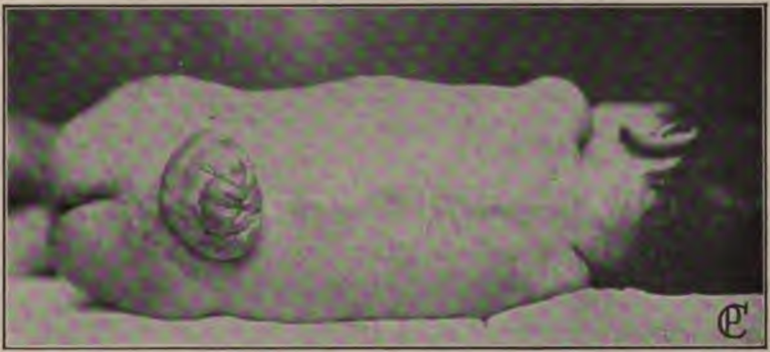

FIG. 161.— Spina bifida.

SECTION XV.

THE COMMONER SURGICAL DISEASES.

CHAPTER XXXIX.

THE COMMONER SURGICAL DISEASES.

Anesthesia.

The administration of an anesthetic to a child is often rightly viewed with apprehension by the practitioner, and questions arise as to the best method and safest anesthetic to employ.

The same phenomena are observed in early life as in adults, but the margin of safety is less, and thus the use of any anesthetic should be regarded as a factor by itself and given the consideration it deserves in relation to the age, the physical condition of the patient, and the character of the operation which is to be undertaken. It should be recollected that any anesthetic given beyond its proper limits is a cardiac depressant.

Choice of Anesthetic.— Ether is preferable if the anesthetist is not thoroughly experienced; if the period of insensibility is to be a long one; in cardiac diseases and in operations for the relief of obstructed respiration, as Ludwig's angina, papillomata of the larynx or deep cervical adenitis. It is also to be preferred if the patient must be kept in an erect or semi-erect posture.

Chloroform in the hands of an expert in anesthesia is sometimes preferable to ether. Children are rapidly brought under its influence, as they usually cry and thus inspire rapidly. Plenty of air, constant vigilance, and the utilization of the drop-by-drop method, depending on each minim administered to add to the effect, is the proper procedure.

In minor surgical affections in which only a primary anesthesia is required, chloroform is of advantage, as the patient rapidly comes out of its influence without the nausea and vomiting which are so often seen with ether. Chloroform is preferable if nephritic conditions are present, or a possibility, as in suppurative adenitis following scarlatina. Lividity of the lips, with an ashen-pale face and weak, slow pulse, are indications that should be met by immediately stopping the anesthetic, inducing free respirations and by hypodermatic stimulation.

Gas-ether anesthesia, in the hands of professional anesthetists, is the method to be selected for older children, but in infancy and the first years of life the nitrous oxid gas is poorly borne and liable to cause suffocative cyanosis.

Anesthesia, according to the method of Schleich, or the spray method with ethyl chlorid, is satisfactory in the hands of those accustomed to them, but cannot be commended for general use.

Preparation for Anesthesia.— Feeble children should not be denied food for a longer period than three or four hours before administering the anesthetic. Often a small amount of a hot liquid, such as thin gruel, will be effective in preventing collapse of the infant. The bowels should be moved by a soap-suds enema, and in older children a dram or two of licorice powder should be given the night before. As the bodily heat is easily dissipated, especially in infants, they should not be unduly uncovered, and artificial heat may be applied during the operation with favorable effect. A preliminary stomach washing in cases of intestinal obstruction with incessant vomiting should precede the operation. Hypodermocylsis and a nutrient enema may also be indicated in certain feeble or anemic infants in whom collapse is feared.

Hernia in Early Life.

Hernia occurs in young children as a result of arrest or defective development of the fetus, which allows the protrusion of some of the abdominal contents through a natural opening.

Etiology.— Hernia in early life may be in the order of their frequency, inguinal, umbilical, ventral, and femoral.

Inguinal hernia occurs more commonly in boys than in girls, and we are inclined to agree with Russell that this form is essentially due to a preformed sac or an obliterated portion of the vaginal process. Such a sac results when a part of the peritoneüm coming down in front of the testicle as it passes into the scrotum in fetal life fails to be obliterated and separated from the remainder of the peritoneal cavity. Thus oblique or indirect hernia is congenitally formed. Coley suggests that the terms "congenital" and "acquired" be abandoned and that we adopt instead the classification of total or partial funicular sacs. Direct and femoral hernias are in the majority of cases acquired, as they rarely result from congenital sacs.

The most common predisposing causes other than the anatomic are constipation, pertussis, tympanites, crying, straining, and coughing.

Symptomatology.— The signs do not differ very materially from those found in the adult. A tumor may appear and reappear several times before attention is directed to it. The tumor gives an impulse to the finger on crying or laughing; it may disappear spontaneously on lying down; it may cause discomfort or even pain at this time of life, and if the intestine has protruded a sensation of gurgling is felt when the tumor contents slip into the abdominal cavity. Strangulation is not common, and when it occurs results from constriction at the external abdominal ring, from tough and inelastic fibrous bands or rings which may be found within the sac (De Garmo), or from fecal impaction. The symptoms of this complication are, besides the tumor itself, nausea and vomiting, constipation with abdominal distention, pains of a colicky character which are increased on urination, increased pulse rate, a variable amount of temperature, restlessness, and if relief is not obtained at this point vomiting becomes stercoraceous with subnormal temperature, and a fatal issue will result.

Diagnosis.— The differential diagnosis is given on page 452.

Treatment.— The great majority of children under three years of age can be cured by mechanical means. This implies the proper application of a suitable truss. This should be made of hard rubber with a slightly convex pad of the same material, or consist of a water pad covered with impervious, water-proof material. These are recommended because they can be readily adjusted and kept clean. Leather trusses soon become soiled or soaked with urine and produce excoriation. The physician himself should select and fit the truss; the spring should be just strong enough to properly retain the hernia even when the child cries or strains. It should be applied only in the prone position and worn continually day and night. Parents should be warned not to unnecessarily remove it unless the child is lying down and the hernia meanwhile digitally retained. A cure is generally affected within a year, although it is advisable to retain the support for a year and a half. If after this time the tumor still protrudes on exertion, recourse must be had to operation.

Children over six years of age are rarely, if ever, cured by the application of a truss.

The treatment of umbilical hernia has been discussed and illustrated on page 14. Operation is indicated immediately in all cases of strangulated hernia. It is necessary in hernia complicated with irreducible hydrocele, in femoral hernias, and in children over four years of age who have not been cured by the application of a properly fitted truss worn over the prescribed period.

The Bassini operation, which is founded upon the etiological factors involved in the production of hernia, almost invariably gives most satisfactory results in competent hands.

Circumcision.

Many male infants need circumcision. The operation promotes cleanliness and inhibits the formation of the habit of masturbation.

In cases in which the adhesions about the glans penis have been separated and the prepuce still does not sufficiently retract, circumcision is indicated. It is certainly necessary in all cases in which the prepuce is tight enough to hold drops of urine or when it balloons out on urination. The prepuce should be so trimmed that the corona is covered and only enough should be cut away so that the prepuce can move freely over the glans. In this way its physiological purpose will be preserved.

This operation should be performed in the early months of life. It should be unnecessary to say that surgical cleanliness is to be observed. With a pair of hemostatic forceps stretch the prepuce, and insert a director between it and the glans. Then incise along the dorsum in the middle line to a point just proximal to the corona. Separate all adhesions until the coronal sulcus is defined and remove all smegma. Cut away the redundant tissue, including both skin and mucous membrane from both sides down the frenum. After all the edges have been carefully trimmed put in three or four fine plain catgut sutures to prevent any exposure of raw surface. Bleeding is slight and probably no ligatures will be required. Use plain gauze strips covered with sterile vaselin for a dressing. If the suture material used is non-absorbable, remove the sutures on the fifth day and powder the wound with aristol.

Appendicitis.

Etiology.— Appendicitis is comparatively rare in early life. In infancy it is extremely uncommon. Invasion of the lymphoid structure of the appendix by bacteria is made possible by traumatism from within or without, by intestinal parasites, mucous inclusion, or constrictions harboring fecal masses.

From a pathological standpoint the disease in children does not materially differ from that found in the adult. It should be recollected, however, that the appendix in children is normally not larger in diameter than a goose-quill; that it is more apt to be found in diverse situations, and that it normally lies higher in the abdomen. Suppuration takes place more readily and localized abscess formations are not unusual. In quite a number of our cases, children with appendicitis were willing to walk about or sit up even when ulcerative conditions were subsequently found at laparotomy.

Symptomatology.— In the *acute inflammatory form* the child may complain of indefinite colicky pains, which are often attributed by the parents to some indiscretion in diet, especially when vomiting occurs early. The fever is not high, rarely rising above 102° F. If the patient is walking about, he usually stoops, and his movements are made cautiously. After being placed in bed he may prefer to lie on his back, drawing up the knees to relax the abdomen. Although if asked to do so he may not hesitate to turn to either side or extend the thighs. The area of pain may not be definitely located by the patient in the right iliac fossa; in fact, he very often refers it to the umbilical region. Dysuria is often a prominent symptom in suppurative cases.

Examination.— On inspection the contour of the abdomen is usually found to be normal, although there may be slight distention observable. Palpation, carefully performed, so as not to excite undue muscular effort, may elicit some resistance and tenderness in the right iliac fossa. In children it is seldom that a definitely localized spot of tenderness is found over McBurney's point. In thin subjects, however, it may be possible to definitely locate the inflamed appendix. If the diagnosis is still in doubt, bimanual rectal examination should be made according to the method described on page 47. A low grade of leukocytosis is usually found in this type.

Such a case of appendicitis may subside under medical treatment, but recurrences are almost sure to follow at some future time, making the prognosis graver than if operation is performed at once or in the interval.

The suppurative form, with a tendency to perforation at or near the tip, occurs more commonly, and the symptoms are more severe. The pain may come on suddenly with fever, nausea, and vomiting. Constipation and tympanites occur, and the patient generally seeks his bed, satisfied to lie quietly in the recumbent posture. The legs are drawn up and the patient localizes the pain more definitely to the right iliac fossa. Temporary anuria or dysurea may be present. The temperature varies between 101° and 103° F. and rarely rises above this point; the fever may not reach higher than 101° F. The pulse rate is increased, especially so if perforation takes place. Gangrenous changes may occur and may be suspected if the subjective or constitutional signs are more marked.

Examination.— On inspection, the attitude of the patient with the knees drawn up, the facies showing distress, the coated tongue and the distended abdomen, with suppressed abdominal respiration, should be suggestive. On palpation of the right side the muscular rigidity is marked and a distinctly painful area of tenderness may be mapped out. In some cases the tumefaction or mass can be quite easily felt. Rectal examination should confirm these findings. Repeated blood examinations will show varying percentages of polynuclear elements ranging from 85 to 95 per cent. If peritonitis has resulted, the abdominal rigidity is increased and vomiting again occurs, the abdomen is distended with gas, obscuring the liver dullness. When the peritonitis is localized about the caput coli the inflamed appendix may be walled off from the general cavity. This is indicated by a diminution of the general symptoms.

An abscess may form within this area from perforation, gangrene or rupture of the appendix. Fluctuation may be obtained, but even before this a sudden drop in the temperature curve points to a focus of pus. A differential leukocyte count will also act as corroborative evidence when the percentage of polymorphonuclear leukocytes is greater than eighty.

Diagnosis.— Cases presenting the classical symptoms of pain in the right iliac fossa, with rigidity of the right rectus muscle, tumefaction, fever, and vomiting, should occasion little or no difficulty in diagnosis. Examination under a general anesthetic may sometimes be necessary in doubtful cases, especially if a skilled surgeon is not at hand. Intestinal obstruction is to be differentiated by the absence of initial fever, the presence of a palpable sausage-shaped mass, tenesmus, and discharges of blood and mucus.

Not infrequently a pneumonic process involving the base of the right lung causes pain which is referred to the ileocecal region, and the unwary may mistake this for appendicitis.

Prognosis.— The tendency toward suppuration and the development of general peritonitis make this disease a grave one in early life. The mortality, however, will be distinctly lessened when early diagnoses are made, followed by prompt surgical intervention.

Treatment.— The medical treatment of appendicitis should consist in immediately placing the patient in bed, allowing him to assume a position of comfort. A light ice bladder is placed over the point of greatest tenderness. The bowels should be moved with a soap-suds enema. A liquid diet, consisting of milk, ice cream, and thin gruels, is given if the vomiting permits. The question of operation should be left to the judgment of a competent surgeon.

Children bear the operation well, and, unless the circumstances contraindicate it, immediate operation is to be preferred to the chances of perforation or general peritonitis.

Intussusception.

(*Invagination.*)

This very frequent form of intestinal obstruction in children is caused by a prolapse of a portion of intestine into the lumen of the adjoining bowel.

While other causes, such as volvulus, Meckel's diverticulum, bands, and foreign bodies, may produce intestinal obstruction, they occur so rarely that they need not be considered here.

Etiology.— We are inclined to believe that the condition can be accounted for by irregular peristaltic action taking place in a gut, the walls of which are thin and undeveloped and only loosely held by mesentery.

The exciting cause may be undiscoverable. We have seen it in breast-fed infants who appeared healthy in every way. Overloading of the intestine, producing fermentation, colic and an irritative form of diarrhea, may induce it. Constipation, tenesmus, polypi in the intestinal wall, appendicitis, and cathartic drugs have been held responsible for its onset. It occurs more frequently in males and the majority of cases occur in poorly nourished children in the first year of life, the fourth to the sixth month being the time of greatest incidence.

Symptomatology.— The onset is sudden and acute in the majority of cases. Only in such situations as the rectum or low down in the colon may the symptoms come on at all gradually. An infant apparently healthy may suddenly begin to cry violently with pain which is usually regarded as colicky in nature, and the extremities may be kept incessantly moving. Vomiting soon occurs, and the child's appearance changes. The face is pale, showing marked evidences of distress and prostration. The first movement of the bowels after the intussusception may contain a slight amount of fecal matter; thereafter the movements consist only of blood and mucus, which are passed with some tenesmus. The vomiting, which is almost projectile, occurs at very frequent intervals. After the stomach contents have been emptied, bile-stained mucus or even fecal matter may be vomited in the final stages. There is little or no fever, but the pulse is extremely rapid and thready. On examination of the abdomen a sausage-shaped tumor may be felt, which, if firmly palpated, may feel harder. This tumor may be found in different situations, but generally is found in the left iliac fossa along the line of the colon. Bi-manual rectal examination may confirm its presence. In some instances it may protrude from the rectum and may be mistaken for a prolapse. It must not be forgotten that intussusception can occur without the presence of a palpable tumor. Sometimes a depression or flattening in the opposite iliac fossa is observed. Unless relief is obtained the prostration becomes more intense, while subnormal temperature and death may ensue from exhaustion. Cases of spontaneous reduction and relief by gangrenous sloughing of the intussusceptum have been reported, but are so rare as to merit recognition only as curiosities.

Diagnosis.— This may be founded upon the following symptoms: The sudden onset, paroxysmal colicky pain, vomiting, prostration, with discharges of blood and mucus without fecal matter.

In our experience dysentery is most often confounded with intussusception. The presence of some [illegible]ter in the stools, the constant fever, and the moderate vomiting, with prostration only proportionate to the severity of the disease, should distinguish the conditions. It should not be forgotten that there may be periods of comparative comfort in the early stages of the obstruction, which may disarm suspicion.

Prognosis.— Unless the condition is promptly recognized and immediate treatment instituted, a fatal issue may be expected. The mortality statistics vary from 60 to 70 per cent. The younger the infant the graver the prognosis.

Treatment.— An attempt and only one should be made to reduce the intussusception if the diagnosis is quite certain within a few hours after the onset of the acute symptoms. It may then be successful, especially if the invagination is in the colon.

The child is placed on its back, the buttocks elevated, and a warm saline solution from a two-quart fountain bag, held four feet above the patient, is allowed to distend the gut. The fluid should be retained by holding the buttocks firmly together. A long, large catheter is preferable to the ordinary hard-rubber tip. While the child is in this position gentle manipulations to assist the reduction may be made. If the result is successful the tumor disappears with a gurgling intestinal sound. Undue efforts in this direction should not be made. If reduction is unsuccessful or the case of longer standing immediate operative interference is demanded. A preliminary stomach washing and stimulation hypodermatically in the form of strychnin or brandy, will better prepare the patient to withstand operative interference.

Acute Peritonitis.

In the New-born.— The diagnosis of the acute forms in infancy are too often made only at necropsy. This is so because of the uncommonness of the affection, the meager history obtainable, if any, the lack of distinctive physical signs, and the inability of the patient to relate subjective symptoms.

Fortunately, acute peritonitis is not a frequent occurrence among children, although in the new-born it is not as rare as is commonly supposed. Through the umbilicus, or skin, pathogenic bacteria may gain entrance and cause peritoneal infection.

The streptococcus, and the bacterium coli communis can be held responsible for the majority of the cases occurring in the new-born. When a general sepsis results the diagnosis is not as difficult as when the infection is localized in the peritoneum.

Symptomatology.— In the new-born, the disease must be considered when there is a localized umbilical infection followed by a sudden abrupt change in the infant's condition. The extremely rapid gasping breathing may first attract the attention of the attendant. The infant cannot or will not nurse, the temperature is persistently high, 104° to 105° F. with a rapid weak pulse. The position assumed by the infant is one of tension. Its legs are drawn up and pain is sharply elicited by attempts to even gently move the legs. The breathing if closely observed is seen to be mainly costal in type and extremely shallow. The distress caused makes abdominal palpation almost impossible. The constant rigidity encountered is quite characteristic. The urine is almost entirely suppressed. Pallor soon becomes marked, and death usually results in two or three days.

In Early Life.— A similar train of symptoms occurs in the early years of life in peritonitis resulting from disease processes in other parts of the body as appendicitis, intussusception, perforation, traumatism, strangulated hernias, lung involvement, or following the acute infectious diseases. Besides the streptococcus, we have the pneumococcus, gonococcus, colon bacillus, or the ordinary pus organisms as etiological factors. Pneumococcic and gonorrheal peritonitis are almost distinctively diseases of childhood.

The diagnosis is likely to be obscured by the underlying affection. The medical attendant is likely to center his attention on the primary disease and is not attracted by the insidious train of symptoms in the abdomen. Invasion of the peritoneum is evidenced by sudden high increase of temperature, or by a subnormal temperature with signs of collapse, extreme pallor, feeble rapid pulse, 120 to 180, and cold extremities. The eyes are fixed and sunken, nausea and finally bile-tinged vomiting may follow. Any attempt to give medication or food by mouth is apt to be followed by vomiting. Constipation is the rule. The postural picture is the same as that just described for the new-born, except that a tympanitic condition is more apt to occur and the young child may feebly attempt to ward off any attempts at palpation of the abdomen. The pain may be referred to the navel or localized in the iliac fossa. The leukocytes are moderately increased.

Peritonitis of gonorrheal origin should be suspected where such a train of symptoms in a female child are accompanied by a specific vulvovaginitis.

Pneumococcic peritonitis may result from any pulmonary disease, and especially from an empyemic process. It occurs here probably by direct infection through the lymphatics of the diaphragm. Hematogenous infection seems to be the usual mode, since pneumococcic meningitis and abscess formations are not unknown. Since the exudation of pus is in this variety considerable in amount, the diagnosis is more readily made by the finding of accumulated fluid in the lower segment of the abdomen. If recognized early and proper measures of rest and posture are instituted, encapsulation is apt to occur, and the prognosis is correspondingly improved. Paroxysmal pains, chills, vomiting, severe diarrhea, and abdominal distention are noted in the early days of the disease. On palpation, there may be fluctuation, corroborated by dullness on percussion. Pneumococcic infection of the peritoneum, though a dangerous disease, is not necessarily fatal, as the pus may discharge through the umbilicus. If, however, surgical measures are not instituted at the beginning, rapid emaciation and prostration usually take place. Diffuse suppurative peritonitis may then result, and a serious prognosis is inevitable. The diagnosis as to the exact form can only be made by examination of the pus which will show the presence of the diplococcus pneumoniæ.

Diagnosis.— The diagnosis in older children with a well-marked train of symptoms is not so difficult. In infancy it is often extremely puzzling and can often be made only by a process of exclusion. The symptom of pain cannot always be depended upon, as it is often relatively less than in adult life.

From intestinal obstruction it is not always easy to differentiate peritonitis, but the lesser amount of abdominal tenderness, absence of fecal vomiting, and the passage of some gas or feces may be of assistance. It should not be forgotten that these conditions may be combined.

Diaphragmatic pleurisy, or even pneumonia, when the pain is referred to the abdomen may occasion a mistake, if a complete physical examination is not made.

Prognosis.— In infancy it is invariably bad. In children peritonitis must always be regarded as a grave affection, although the encapsulated forms offer some little hope. If a perforation has taken place or if the process is general a fatal issue is to be expected. The gonorrheal variety, especially in older children, has a better prognosis.

Treatment.— An early diagnosis will be of value to the patient if prompt measures are taken to insure bodily and intestinal rest. If the case is seen very early, calomel or a saline may be given, before the application of an ice-coil. Paregoric for young children and codein hypodermatically for older cases will be required to alleviate the pain and to inhibit peristalsis. No attempt should be made to feed the patient. Pieces of ice or sips of ice-water to which brandy has been added are grateful and often allay vomiting. Hypodermoclysis and stimulants may be required for the pulse.

The surgeon should be consulted as early as possible and decide as to the feasibility of operative interference.

Ascites.

By ascites is meant the condition produced by an effusion of serum into the peritoneal cavity. It may occur as a secondary condition in peritonitis in any of its varieties, in chronic nephritis and in certain blood diseases. Obstructions to the portal circulation, and chronic diseases of the heart and lungs may also produce ascites.

Diagnosis.— The physical signs differ in nowise from those obtained in the adult, and therefore may be omitted here.

Chylous Ascites.— The diagnosis of this rare form is made only after aspiration. Several cases have lately been reported. Its causation is unknown, but is attributed to some obstruction or disease of the thoracic duct. The ascitic fluid is milky white in color and usually contains fat globules in a fine emulsion. Leukocytes and a few red blood-cells may be found.

Treatment.— Withdrawal of the fluid for the relief of pressure symptoms may be necessary in advanced cases, otherwise the treatment resolves itself into measures directed to the primary condition.

Ischiorectal Abscess.

These abscesses are more commonly observed in children of poor nutrition who have been reared under unhygienic circumstances. Through the lymphatic channels of the rectum, the perirectal lymph nodes become infected and form an abscess. The diagnosis is made on inspection and palpation or by rectal examination.

Treatment.— Free incision, cleansing with antiseptic solutions, such as the peroxid of hydrogen and stimulation with a 2 per cent. silver nitrate solution, or packings saturated with balsam of peru and castor oil, one to ten, will effect a cure. In tuberculous children these abscesses may be exceedingly intractable and do not tend to heal until the general nutrition is improved.

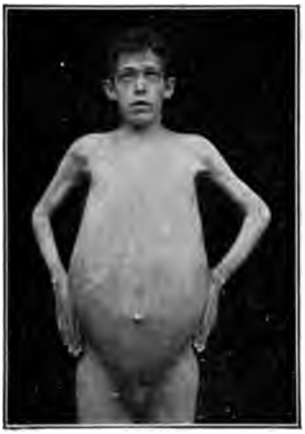

Fig. 162.— Characteristic shape of belly in ascites. (*Cabot.*)

Rectal Polypus.

The growths are commonly found low down in the rectum and attached by a pedicle. Rarely are they multiple and sessile. On examination they are found to be adenomatous or fibromatous in structure. They vary in size, but rarely are larger than a hazel nut.

Symptomatology.— The case is usually brought to the attention of the physician because of intermittent hemorrhages which may or may not be accompanied with tenesmus. Sometimes only the fecal masses are blood-streaked. If the straining is persistent prolapse of the rectum may result. Rectal examination is indicated with the above train of symptoms and the source of bleeding will then be found.

Treatment.— The removal of the pedunculated tumors is easily accomplished by twisting the pedicle or passing a ligature about it before cutting it. If it cannot be withdrawn the use of an anesthetic and a speculum will be required so that bleeding from the stump may be arrested.

Fissure of the Anus.

This may occur following the passage of a hard constipated movement. It is also seen in children suffering from marasmus, syphilis, and eczema. Occasionally a fissure is produced by undue dilatation of the sphincter by injections, suppositories or rectal examinations. Pain, some bleeding, and tenesmus are the signs which should lead to a careful inspection of the anal region.

Treatment.— The buttocks should be separated as widely as possible and the fissures touched daily with a solution of silver nitrate, dram one to the ounce. If constipation is present laxatives or enemas with careful oversight of the diet will promote healing. In intractable cases the rectum should be gently dilated, a feat which is easily accomplished in children by the successive introduction of well-greased fingers beginning with the smallest. This procedure should cause little or no pain, and generally effects a cure.

Prolapse of the Anus and Rectum.

Prolapse of the rectum is more commonly observed in children of the second and third years of life. The protrusion may be partial, being only a simple eversion of the mucous membrane, or complete, in which all the layers of the rectal wall protrude outside of the sphincter, sometimes for one or two inches.

Etiology.— The causes provoking this condition are those accompanied by much tenesmus, such as colitis, straining in chronic constipation or diarrhea, or with calculi. Rectal polypi will often lead to a prolapse. A neglected cause is the use of stooling chambers too large to give proper support to the buttocks. Anemic and badly nourished children are particularly prone to this affection, as in them the pelvic musculature is incompetent.

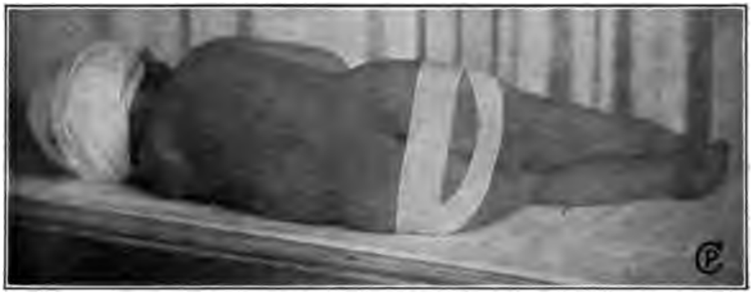

FIG. 163.— Adhesive plaster dressing for prolapse of the rectum.

Symptomatology.— The protrusion of a dark red cone-shaped mass covered by transverse folds of mucous membrane, and with a rounded opening at the apex of the tumor is diagnostic. In some cases blood-streaked mucus soils the clothes. The mass can usually be readily replaced, but the protrusion will be apt to recur after straining or coughing or with the next defecation unless preventive measures are taken.

Diagnosis.— Although the diagnosis is generally easily made, one of us has seen a mistake made in a case of intussusception in an infant in whom the invaginated gut protruded from the rectum.

Treatment.— This consists in replacing the tumor and retaining it. A piece of gauze covered with vaseline is placed over the tumor, and by gentle pressure exerted over the entire mass the prolapsed tissues will slip back into place. If the reduction has been delayed too long it may be necessary to apply ice or ice-cold cloths for a short period and then to repeat the above manipulation.

Two wide bands of adhesive plaster applied over the buttocks, above and below the anus, so as to exert firm pressure and give added support to the pelvic attachments, will retain the prolapse. Local conditions, such as constipation, colitis, and polypi, should be remedied and conditions of malnutrition corrected before a hope of permanent cure can be entertained.

The child must lie on a bedpan during defecation and the movement should be induced by a mild enema of oil or glycerin. He should be taught to avoid excessive abdominal pressure. Local applications of astringents, such as the fluid extract of krameria or tannic acid ointment, are helpful. The diet should be so regulated during the cure that the movements passed will be soft and unformed. Mild laxatives as cascara or the milk of magnesia may be necessary.

In exceptionally severe or neglected cases, the prolapsing mucous membrane must be linearly cauterized by the thermocautery to produce cicatrix, or a radical operation may be necessary.

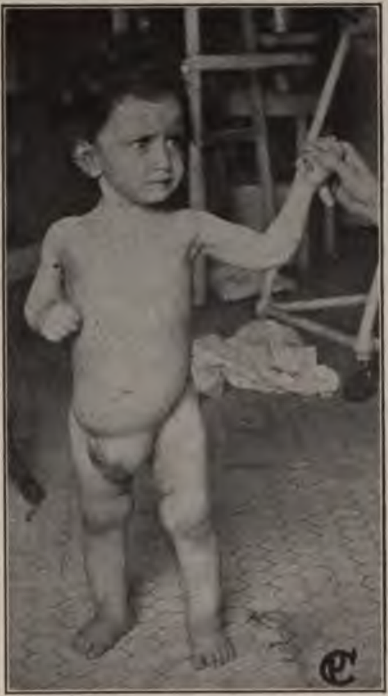
FIG. 164 — Sarcoma of the lower abdomen.

Malignant Tumors in Children.

While almost any form of benign or malignant growth may occur in early life, it may be said that carcinoma is quite rare, while sarcoma is much more frequent. When this form occurs in children it is much more malignant than in adults.

Three types are known, the round cell, spindle cell and giant cell varieties, the first being the most malignant.

Nevi sometimes become sarcomatous, but the bones, kidney, testes, and epidermal tissues are more frequently involved. The ends of the long bones showing a special predilection.

Sarcoma of the face often causes confusion of diagnosis. Sarcoma of the kidney which is often congenital may attain an immense size. Their growth is exceedingly rapid and they are never bilateral. (See p. 442.)

Diagnosis.— The shape and size of the tumor is determined by its site and the tissues involved. The tumors are at first freely movable if located in soft tissues; they are seldom hard and firm; on the contrary, they may even feel fluctuant. Particularly suggestive are the superficial veins, usually dilated, which are found over these tumors. The skin covering them may be somewhat dusky or bluish in color.

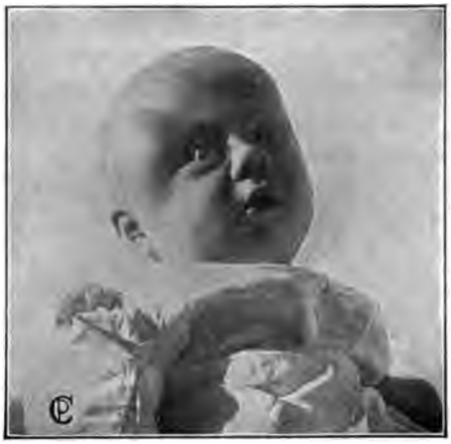

Fig. 165.— Osteo-sarcoma of the temporal bone

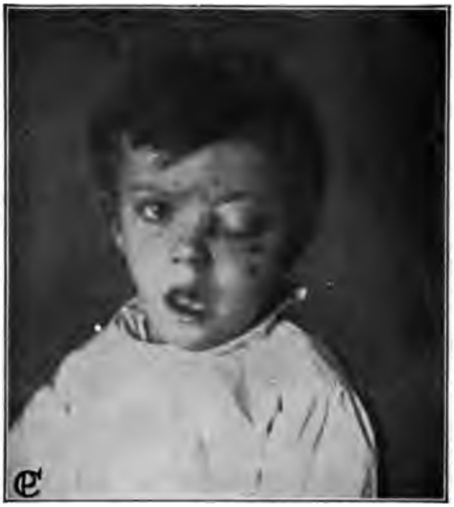

Fig. 166.— Sarcoma of the face.

Metastases occur by way of the blood stream, consequently adjacent lymphatic glands are not involved.

Treatment.— Sarcoma is of relatively rapid growth and extension and this fact makes an early diagnosis essential, as complete removal is the only treatment.

Coley's fluid which contains the toxins of streptococcus, erysipelatosus and bacillus prodigiosus can be tried in inoperable cases with the hope of arresting the growth. It is administered hypodermatically the injection being made into the periphery of the growth. Begin with injections of one minim, and as tolerance is produced the dose may be increased to five minims twice a day.

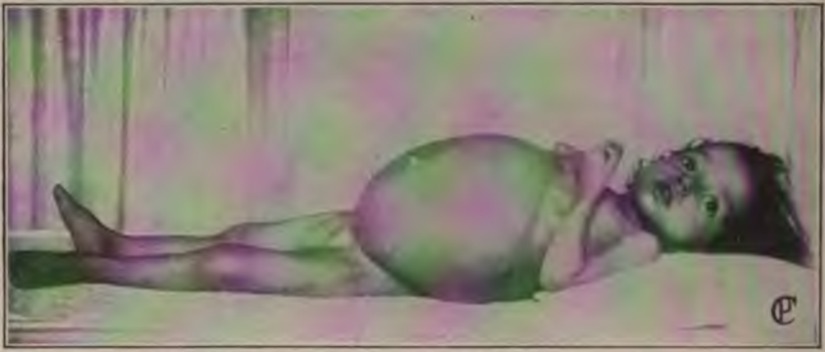
FIG. 167.— Sarcoma of kidney.

In certain situations, as on the face, considerable pain is experienced unless fairly powerful analgesics are given.

SECTION XVI.

DISEASES OF THE EAR AND EYE.

CHAPTER XL.

DISEASES OF THE EAR.

General Considerations.

Familiarity with the anatomy of the organs and structures of hearing, at least in a general way, is incumbent upon those whose practice is among infants and children.

At birth the external bony canal has not developed and there is present only a cartilaginous canal. The walls of the soft meatus may in infants be found almost in contact so that the tympanic membrane is examined with difficulty unless these are separated. In structure the walls of the meatus are thicker than in the adult. The vault of the tympanum is disproportionately large and may have an incomplete tegmen. The Eustachian tube is shorter, horizontal, and relatively wider, the pharyngeal outlet being on a line below the hard palate. The mastoid process is entirely undeveloped at birth, and it is not until puberty that it assumes the adult characteristics. The antrum, however, is developed, surrounded by thin bony walls. The close relationship of the sutures and the lateral sinuses to these structures accounts, in greater part, for the frequency of intracranial complications in early life.

Otoscopy.

For this purpose a good light and a properly shaped speculum (see Fig. 168) is necessary. The child's arms should be fastened to its side by wrapping in a large sheet or towel; the attendant holds the child with one arm thrown about the chest and with the other on top of the head keeps the ear in the right direction. By drawing the auricle downward and backward a better view can be obtained. Accumulations of wax or exfoliations of the drum membrane must first be removed by the use of a fine cotton-tipped applicator before a good view of the drum can be had (McKernon).

If the ears of normal children are first examined the method and a working knowledge of the normal appearance will soon be obtained and otoscopy will then be more frequently made a part of the routine examination, and aural complications will go unrecognized less frequently, and more serious complications, such as mastoid involvement and deaf-mutism, prevented. The descriptions in this section are for diagnostic purposes and the reader is referred to books on this special subject for details of treatment.

Otitis.

This is very common in early life, occurring almost always secondarily to the acute exanthemata, gastroenteritis, influenza, adenoid vegetations, and chronic rhinitis. Less commonly it may follow such diseases as typhoid infection, diphtheria, acute follicular tonsillitis, and cerebrospinal meningitis. It may also be induced by improper methods of nasal irrigation or by violently blowing the nose, the bacteria in the nasopharynx being forced into the Eustachian tube.

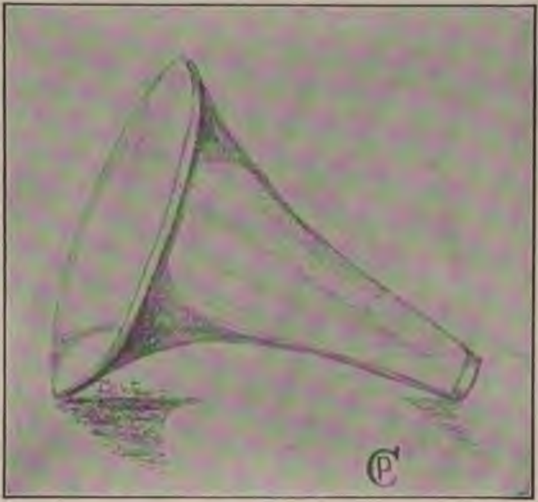

FIG. 168.— Properly shaped ear-speculum.

According to Liebman, the streptococcus is most frequently found (52 per cent.), streptococcus mucosus next in frequency (8 per cent.), then the pneumococcus (6⁴⁄₁₀ per cent.).

Symptomatology.— Unfortunately, in many instances otitis occurs during the course of an illness, as, for example, in measles, and unless daily otoscopic examinations are made, the first intimation of the process is a discharge from the external ear. If after the acute symptoms of the primary disease have subsided a sudden and rather constant elevation of temperature, with or without earache, occurs, otitis should be suspected.

In some cases rupture takes place even without elevation of temperature. When in infants there is restless sleep with sudden unexplainable outcries, pulling at the ear, with pyrexia higher at night, inflammation within the ear should certainly be thought of. Older children who are able to localize and speak of their pain describe it as "stinging" in character. The pain comes on at intervals and is worse toward evening and during the night. Otoscopic examination in these cases will disclose a much reddened, swollen, or bulging membrane. If the process has not advanced to the point of actual suppuration there may only be found a crescentic area above Shrapnell's membrane with absence of the normal shining appearance of the lower half.

If the perforation has occurred, the opening is usually seen in the posterior and lower quadrant. The discharge may be serous, seropurulent, or purulent in character. Chronic otitis media, sinus thrombosis, and meningitis sometimes follow. In most of the cases, however, following spontaneous rupture or incision of the membrane the discharge after a time ceases, healing takes place and restitution to normal occurs, often with little or no disturbance to the hearing.

Treatment. Prophylactic.— Daily examination of the tympanum in the course of the acute infectious diseases, the removal of adenoid growths and hypertrophied tonsils, and the inculcation of habits of cleanliness, such as the nasopharyngeal toilet (see p. 73), will do much to prevent the involvement of the ear.

General.— Early incision of the drum membrane should be practiced in the acute cases if the condition of the membrane warrants. Hot irrigations of saline solution at 110° F. with a fountain bag held two feet above the ear, give considerable relief, and in the milder cases the symptoms may entirly subside under this form of treatment. Chronic conditions require copious irrigations with a warm solution of (1/10,000) bichlorid of mercury several times a day. It is best to refer these cases to the specialist for more radical treatment if they do not show improvement after a few weeks.

Mastoiditis.

This most frequently results as a complication of acute or chronic middle-ear suppuration and the same etiological factors as given under the article on Otitis concern us here. The anatomical structures as outlined in the general consideration and the greater tendency toward necrosis of bone in early life favor the involvement of the mastoid process.

Symptomatology.— The symptoms appear after a variable time during the convalescence following an artificial or spontaneous rupture of the drum. A sudden or gradual pyrexia may be the initial symptom. This, as a rule, is not high, but continues several days, reaching its highest point in the evening. Otoscopy, if there has been a previous perforation, may show a decrease in the amount of discharge, but the pus may show that some retention in the deeper structures has taken place by appearing in drops after cleaning the canal. Sometimes there is seen prolapse and bulging of the superior and posterior portion of the canal wall. Restlessness with frequent periods of crying, especially at night, is present in most of the cases. Occasionally the temperature reaches 104° or 105° F. in the evening, and the lymph-glands in the neighborhood are swollen. The tissues over the mastoid may become edematous and the auricle is pushed out from the scalp. In unrecognized cases a perimastoid collection of pus takes place, especially in infants, and pressure over this tumefaction causes a discharge of the pus which has collected in the external canal. Meningeal symptoms may appear or in neglected cases the cerebral symptoms may predominate and obscure the diagnosis.

Treatment.— An early diagnosis is imperative in mastoiditis, for it is only by the radical operation which drains the middle ear that the mortality in this serious disease may be lowered or more serious complications, as infection of the jugular bulb, avoided.

Infective Cerebral Sinus Thrombosis.

(*Jugular Bulb Infection.*)

The most frequent cause of local infection of the cerebral sinuses is suppuration in the middle ear and mastoid cells. A general septicemia as a result of aural complications may also produce sinus thrombosis through the general circulation. Streptococci are most frequently found to be the direct cause of the infection.

Symptomatology.— The disease should be considered if there is a sudden rise of temperature in a patient who has a discharge from middle-ear disease. This fever is extremely irregular, septic in character, rising often to 105° or 107° F., with remissions to the normal or subnormal. The pulse rate is correspondingly high, the infant is at first highly irritable and restless and soon becomes apathetic and finally stuporous. There may be evidences of meningeal involvement with vomiting and convulsions, and pain in the cervical region. If the disease has resulted from the mastoid there may be edema in this region, and perhaps, a clot in the jugular vein. The percentage of polynuclear elements is high, ranging from 80 to 90 per cent.

Prognosis.— This is extremely unfavorable. A fatal issue usually results in a few days unless operative interference is successful.

Treatment.— Early diagnosis followed by prompt operative procedure is the only recourse. Recent reports show encouraging results.

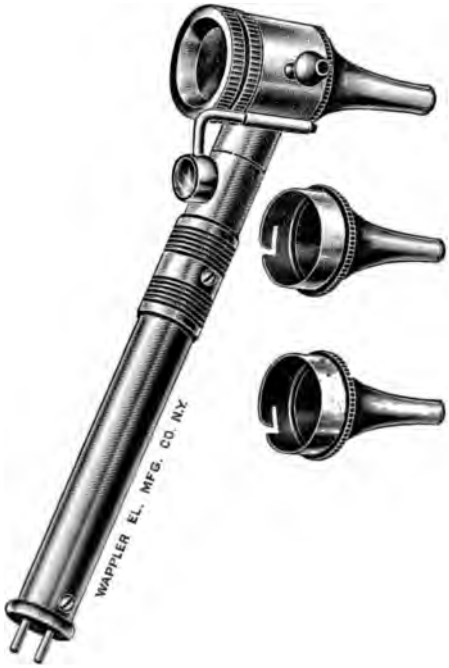

FIG. 169.— A serviceable electric auroscope particularly adapted for children.

CHAPTER XLI.

THE COMMONER DISEASES OF THE EYE.

Foreign Bodies.— Foreign bodies are frequently caught under the eye-lids of children, and if not washed away by their own tears, which are usually copious, they should be quickly removed to prevent inflammatory changes. The upper lid can be everted easily if the child is prone and correctly held to prevent interference. The foreign substance can usually be easily removed by a fine probe, the end of which has been wrapped with a few strands of absorbent cotton. Metallic substances may require local anesthesia, which is accomplished with two drops of a 2 per cent. solution of cocain. If the particle is not readily removed, the patient should be referred to a properly equipped ophthalmologist.

Blepharitis.— This is often observed in tuberculous, anemic, or poorly nourished children, especially when they have a dermatitis elsewhere on the body. The secretion as it dries produces further excoriations and aggravates the trouble. Treatment should be directed to the general condition, improving the nutrition by proper diet, cod-liver oil and iron tonics for the anemia. General cleansing baths daily with bicarbonate of soda will prevent reinfection. Locally, the eye-lids are bathed with a 2 per cent. boric acid solution until all the crusts are removed and applications of an ointment of yellow oxid of mercury (1/100) are then made morning and night until a complete cure is produced.

Conjunctivitis — *Acute.*— Injuries and the infectious diseases produce acute inflammations quite readily in children and the mucoid secretions are apt to be more profuse than in adults. The eye-lids should be gently separated and the secretions flushed out. Microscopical examination of a purulent secretion should be made to determine the possibility of infection by the Klebs-Loeffler bacillus or the gonococcus of Neisser. A careful search should be made for foreign bodies. If there is no secretion, applications of a 2 per cent. warm boric acid solution every fifteen minutes may suffice for a cure. If the secretion is purulent, argyrol in 12 per cent. solution (freshly prepared) may be ordered or silver nitrate (1/100) may be applied by the physician and quickly flushed out with sterile salt solution. Ice-cold applications are often necessary and should be freshly applied every ten minutes until the inflammation subsides. A drop of atropin sulphate (1/200) may be necessary two or three times a day to procure rest for the eye.

Diphtheritic.— The membrane is tenacious, with an absence of secretion and much exudation and edema in the eye-lids. The extreme rapidity of the involvement and the presence of a possible nasal diphtheria should excite suspicion. The treatment is that of diphtheria elsewhere. An injection of 10,000 units of antitoxin should be given, and locally the eye should be flushed with boric acid solution and kept cold with ice compresses. Protecting the sound eye from infection may be accomplished by the use of a shield or the instillation of a 25 per cent. solution of argyrol every two hours.

Chronic.— A careful examination for ocular defects should always be made in these cases and the child's habits as to study, etc., inquired into. Not infrequently the condition is improved by appropriate general treatment or a change from urban to rural life. Locally, astringent applications of zinc sulphate (1/250) or silver nitrate (1/500) may be made by the physician several times a week and one of the organic silver salts supplied for home use, as argyrol in ten per cent. solution one or two drops, twice a day. Internally the syrup of the iodid of iron is often of assistance.

Trachoma (granular conjunctivitis).— Routine examination of the school children in New York City has brought to light many cases of chronic conjunctivitis which are termed trachomatous. The condition occurs in several children of a family and certainly appears to be of a microbic nature. Ordinarily the type seen is mild in character and is often classed as granular conjunctivitis. The heaped-up granulations and deposits are plainly seen when the lids are pulled down. The upper lid should also be everted and examined. Marginal ulcerations may occur if the disease is allowed to run its course untreated.

Treatment should be proportionate to the severity of the condition. Prophylactiç measures to protect other children in the family and school should be insisted upon, such as individual towels and wash cloths. Constant supervision and treatment will finally eradicate the condition and lessen the host of cases now in our schools.

Locally, a solution of zinc sulphate (1/250) or the cupric stick may be used by the physician several times a week on the granulations. A solution of bichlorid of mercury (1/5000) or argyrol 10 to 20 per cent. may be ordered for home use, one drop being instilled twice a day in each eye. Severe cases will require the expression operation with forceps under a general anesthetic.

Chalazion.— A chalazion is a cyst which results from retention products of the Meibomian glands. There is rarely any pain, although discomfort is complained of by older children. They are generally excised if they tend to recur.

Hordeolum or stye is found on the margin of the eye-lid and acts like a furuncle on any other part of the body. The evacuation is hastened by hot applications and early incision.

Strabismus.— Strabismus (squint) may be either paralytic or non-paralytic. Paralytic squint is due to partial or complete paralysis of one or more of the muscles of the eye. It may be congenital, or it may be acquired from trauma or from an acute infectious disease, such as diphtheria or cerebrospinal meningitis. It may also result from photophobia, phlyctenular keratitis, and interstitial keratitis.

Non-paralytic squint in children is more common, and it is usually convergent. Contrary to a common belief, children seldom "grow out" of it. If neglected, the squinting eye usually becomes amblyopic. Neglected "cross eyes" are responsible for many blind eyes in adults. If prescribed sufficiently early, correct glasses accomplish cures in many of these cases. Even young children can wear glasses without danger.

Keratitis.— This is usually found in tuberculous and rachitic children, secondary to other ocular and dermal conditions, although syphilis itself causes the interstitial or parenchymatous variety.

The condition begins with congestion and involvement of the tissues about the cornea. There is photophobia, orbicular spasm, pain, and an abnormal flow of tears. Later a haziness is observed and vision is impaired. The superficial lesion, if untreated, soon invades the cornea, and ulceration or even suppuration results.

The phlyctenular variety is most frequent in early life. Beginning with small vesicles on the palpebral conjunctiva, it spreads to the ocular conjunctiva and here forms characteristic ulcerations which may leave permanent opacities of the cornea. Treatment should be directed to the underlying constitutional condition. The interstitial form generally reacts to antisyphilitic treatment. Children poorly nourished or badly housed must be removed to hygienic quarters to effect a cure. Good food, fresh air, and baths add greatly to the possibilities of local treatment. Any fissures in the angles should be treated with silver nitrate solution (dram one to the ounce), followed by a flushing with normal saline.

Placing a shade over the eyes is preferable to a darkened room for the child. Bathing with hot boric acid solution three or four times a day is soothing and helpful. An ointment of yellow oxid of mercury (1/100) may be supplied for use on the eyelids at night in phlyctenular keratitis, and an ointment of bichlorid of mercury (1/5000) applied for the other varieties. A solution of atropin sulphate (½ per cent.) may be necessary in some cases to give rest until the child responds to the general treatment.

The Diagnostic Significance of Ocular Affections.

The eye may so often be of assistance in establishing a diagnosis that a short article will be devoted to the interpretation of certain ocular lesions or manifestations.

Every physician should be prepared to make certain simple tests in his office to discover ocular defects, and the eyes should be examined in the routine examination, even when the patient is not presented for defective eye-sight. In this way he may find the cause for backwardness in school studies, headache, and dizziness. Of still greater importance is the fact that recognizing unsuspected deficiencies in visual acuity he will refer the child to an oculist for more rigid and detailed tests and correction of refractive errors while the eye is still in the formative period. All that is required for these tests is a Snellen's test card, a graduated picture card for children unable to read, a candle placed at twenty feet and the multiple rod of Maddox for testing the functional balance of the ocular muscles.

Valk has shown that the Americans as a nation are found to be far-sighted with astigmatism. There is no doubt that many of the children of this generation suffer from overuse of their eyes because of the competition of school life and the multiplicity and cheapness of all forms of reading matter to which they have unrestrained access.

Parents must be warned of these conditions and prophylactic measures advised to protect the vision of their children so that artificial aid may not be required. The study room should be well-lighted and ventilated, with the desk or table so placed that the light will come over the left shoulder. The use of vertical writing is to be commended. Reading in the recumbent position or during convalescence should be prohibited. Badly printed books should not be tolerated in these days of modern printing.

Diagnostic Hints.

Ptosis as seen in children is usually a congenital defect as lesions of the oculomotor nerve are exceedingly uncommon in childhood.

Photophobia is not uncommon and usually indicates some inflammatory affection of the structures of the eye, for example, corneal ulceration. It does not usually occur with conjunctival diseases.

Exophthalmos, or prominence of the eye-ball, is sometimes seen in older children who have the symptoms of goiter.

Diplopia indicates paralysis of any of the straight ocular muscles, and it may result from any cause which will prevent both eyes being fixed on the same point. The form varies with the muscle affected. It is sometimes a symptom in hereditary ataxia.

Strabismus appearing suddenly, convergent in character and accompanied with diplopia, is one of the signs of tuberculous or basilar meningitis. It may also be seen in hysteria, but here is functional only in character.

Nystagmus, or rapid oscillation of the eye-balls, may be lateral, vertical, or rotary movements. It usually is bilateral. It occurs rarely congenitally, and is then without serious significance. It is observed in many cerebral diseases, especially those associated with congenital defects, in disseminated sclerosis, and in Friedrich's ataxia. Tumors of the cerebellum or pons may produce this ocular symptom. It is sometimes seen in the later stages of hydrocephalus.

Optic Neuritis (Choked Disk), Papallitis.— This condition may be found on ophthalmoscopic examination and indicates some form of intracranial lesion or affection of the orbit. Papillitis is seen in meningitis, particularly of the tuberculous variety; sometimes it occurs with tumor and abscess of the brain.

SECTION XVII.

DISEASES OF THE SKIN.

CHAPTER XLII.

DISEASES OF THE SKIN.

Introduction.

Diseases of the skin form a very important part of the affections of early life. In infants this is particularly true, owing to the hypersensitiveness of the skin, which is suddenly bereft of its covering of vernix caseosa at birth and exposed to irritants of varying degree either from without or from within. It must also be recollected that faulty metabolism will account for many of these skin lesions. Young protoplasm is very irritable, and hence comparatively slight causes may produce severe lesions of the skin.

The causative factor should be carefully sought after in each case, and treatment should be directed not alone to the local lesion, but to the systemic condition as well. When prescribing local treatment the tenderness and sensitiveness of the infantile epidermis should not be forgotten. Better and more permanent results are obtained if soothing and unirritating drugs are employed and if the skin is protected from further injury by prevention of scratching or further infection. The latter condition often masks the nature of the original disease, hence the most recent lesion must always be sought for diagnostic purposes.

A certain number of skin diseases are congenital or are seen mainly in infancy. These will be mentioned first and then the commoner diseases met with in the early years of life, and finally those seen for the most part in the school age.

Ichthyosis.

(*Xerodermia.*)

Ichthyosis, or fish-scale disease, is regarded as a congenital skin affection, mainly transmitted by heredity. It is characterized by a dry scaling condition of the skin, whose outer layers are hard, dry, and thickened and without any inflammatory phenomena. Several members of a family may be affected.

Symptomatology.— The whole body, as a rule, may be covered with a scaling, wrinkled, papery skin, especially on the outer surfaces of the arms and legs. In the flexures of the joints fissures are sometimes formed. The general health remains unaffected. Irritants easily cause pruritis and local inflammatory reaction.

Diagnosis.— The disease is rarely mistaken on account of its distinct characteristics. The history and its non-inflammatory character distinguish it from trophoneuroses or pityriasis.

Prognosis.— It is an intractable disease requiring long and patient treatment to affect any amelioration. It is never really cured.

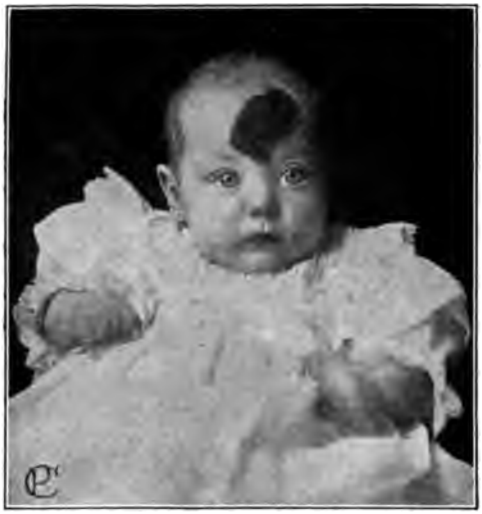

FIG. 170.— Pigmented nevus.

Treatment.— If the treatment is begun in early infancy much more can be accomplished than when seen later. Baths of green soap, followed by inunctions of lanolin or vaselin and protection of this greased surface with gutta percha tissue, later a 5 to 10 per cent. sulphur ointment, can be applied. Life in the tropical countries is favorable to comfort and possible cure.

Nevi.

These congenital growths may be vascular or pigmented (moles). The latter may also be hairy or rough and warty. The color varies from a light brown to black. Vascular nevi are due to local excessive proliferation of blood-vessels at or soon after birth. These disfigurements are found for the greater part in the corium, and vary from the familiar port-wine stain to pulsating angiomata. They are apt to increase in size soon after birth and do not grow beyond certain limits.

Prognosis.— Vascular nevi of the cavernous type may be dangerous to life because of the danger of bleeding or from their effect on neighboring structures. Pigmentary nevi have shown metamorphic changes into later growths of a malignant character.

Treatment.— This is accomplished by electrolysis or cauterization acting upon the corium only. Radiotherapy occasionally is successful. Excision offers the best results; occasionally skin grafting is necessary following excision of a large nevus. A needle may be heated to a cherry-red color and plunged into the margin at three or four points. This may be repeated at subsequent sittings until the nevus has been entirely eradicated. A white scar remains over the site. Ice made from liquid carbon dioxid is often suitable for the removal of port-wine stains or superficial nevi.

Dermatitis Exfoliativa Neonatorum.

(*Ritter's Disease.*)

Badly nourished infants, usually nurslings, are affected by this disease. It is quite rare. It begins, as a rule, on the lower half of the face as a reddened area with exfoliation. This erythema soon spreads over the entire body, and the resulting scaling is profuse. Fissures appear at the mouth and anus. Constitutional symptoms are those of malassimilation or, in severe cases, those of sepsis. Even when restitution to the normal takes place after patient and diligent treatment, relapses are not uncommon. Ritter gives the cause as a general sepsis.

Course and Prognosis.— The two cases coming under our observation in hospital practice were markedly toxic, and both died. The mortality is 50 per cent. Occurring as they do among the poorer classes, medical attention is not drawn to them until the vitality has suffered beyond repair.

Treatment.— Maintain the body heat by the use of lanolin and such management as is recommended for the premature (see p. 2). Carefully examine the breast milk, and if abnormal a wet-nurse is indicated. Strychnin in doses of gr. 1/300 every two or three hours is given if the vitality is low.

Pemphigus Neonatorum.

This is a contagious skin disease characterized by the formation of bullæ containing a purulent fluid. No specific microorganism has as yet been isolated. The large vesicles or bullæ may sudlenly make their appearance on any part of the body, causing little or no systemic disturbance. The blebs vary from transparent to grayish forms. The distended vesicles may rupture, leaving a crust and a reddened base, but no scar formation results. The exudate may infect new areas or even those in contact. The disease usually runs a favorable course, tending to complete recovery in a few weeks. They should be differentiated from the bullous syphiloderm, sometimes called syphilitic pemphigus, which occurs mainly on the soles of the feet and palms of the hands, with usually an ulcerated base, and is accompanied with other manifestations of infantile syphilis.

Treatment.— Evacuate each bleb carefully by pricking with a sterile needle, and apply zinc stearate for desiccation. A daily bath in a solution of bichlorid of mercury (1/10,000) is indicated if self-inoculation is evidently going on.

FIG. 171.— Impetigo

Impetigo Contagiosa.

This skin disease usually attacks the face at the corners of the mouth and nostrils, although any portion of the body may exhibit the lesions. These consist of grayish-yellow sticky crusts which have a honey-like discharge. They are seated upon a red base. The child eagerly picks at these crusts and infects other areas.

Treatment.— The general health, if deficient, will require proper feeding with iron or cod-liver oil. The crusts are softened by green-soap poultices and removed. The areas are then covered with benzoated lard or lanolin with bichlorid of mercury gr. i to the ounce.

Seborrhea Capitis.

Overactive sebaceous glands produce a crust of sebum which soon becomes dry and scaly. It commonly occurs upon the scalp and forehead in infants, and is known by the laity as "milk crust." It is a dirty yellow, firmly adherent mass lying upon an uninflamed surface. It is more commonly found in poorly nourished children than in lusty breast-fed babies.

Treatment.— Attention must be given to the general nutritional requirements, together with local applications of warm olive oil or boric acid ointment (10 per cent.) under an oil-silk cap. Applications of the ointment are made twice a day, until finally the crust has softened. They are then removed with a superfatted soap or a glycerin soap and the scalp anointed daily for a time with a 2 per cent. sulphur ointment.

Erythema Multiforme.

This is an acute inflammatory disease, in which are variously produced areas of erythema, macules, papules, or vesicles. Some constitutional disturbance may usher in the attack. This is usually mild in character; there may be fever and malaise with or without rheumatic pains. The lesions, as a rule, appear on the extensor surfaces of the hands, arms, feet, and legs. The face and upper chest are often involved, although any part of the body may exhibit the eruption. The color varies from a light red at first to a deep red in older lesions. Only occasionally are hemorrhagic areas seen. Pruritus is not a marked symptom. Accompanying the erythema in children there are usually observed symptoms of intestinal derangement, autointoxication, ptomain poisoning, etc., which have undoubtedly produced this external manifestation. The disease is liable to recurrence, lasting, as a rule, for a few weeks before subsiding.

Treatment.— This should be mainly directed to the underlying viceral derangement. An initial purge is indicated in the form of calomel or castor oil. A careful history of the child's diet will nearly always disclose some radical fault which needs correction. A specially arranged dietary should be provided. The emunctories should be kept active. Locally, if there is pruritus, an ointment containing resorcin or acid carbolic may be applied.

Acute Exfoliative Dermatitis.

This condition is of interest because of the confusion which it may cause in children from its resemblance to scarlatinal infection.

Intestinal toxemia will commonly be found to be the underlying cause. Following an erythema of the scarlatiniform type, in a few days or sometimes hours, there occurs a profuse exfoliation. Constitutional symptoms are more pronounced than in scarlatinal erythema. The exfoliated scales of large and papery strips are cast off (see Fig. 8, Plate IX). The hair and nails may drop out before the process is complete. Furnuncles and pustules are sometimes engrafted on the dermatitis with involvement of the neighboring lymphatic glands.

Diagnosis.— The differential diagnosis in the erythematous stage and in that of exfoliation is given under the article on Scarlet Fever (see page 224).

Treatment.— Correct the toxemia by unloading the intestine and prescribing a diet that will not cause fermentation. Repeated examinations of the urine for indican will assist in properly meeting this indication. Fowler's solution with iron is of value after the dietetic error has been corrected. A 2 to 5 per cent. ichthyol ointment is soothing to the skin. The cure is slow and recurrences are frequent. The exfoliation may occur two or three times a year.

Eczema.

(Tetter; Salt-rheum.)

This is a protean disease of unknown origin assuming an acute, subacute, or chronic course, characterized by an erythematous eruption of varying intensity, which goes on to scaling or crusting and is associated invariably with marked pruritus.

It is the most common of all the skin diseases observed in early life.

Etiological Factors.— Irritants either of external or internal origin, or both, are responsible for the affection. Children who have the spasmophilic tendency, nutritional or blood disorders, are particularly susceptible. The usual pyogenic bacteria found on the skin are no doubt responsible indirectly for many cases. Their growth is facilitated or i by mechanical or chemical irritants with which the child comes into contact. The so-called "predisposition" to the disease is often accounted for by careful investigation for the cause along the lines above enumerated. Parasitic skin diseases, discharges from various parts of the body, badly prepared soaps and powders, and irritating underclothing are among the more common external causes. Excessive feeding, in general or in kind, but particularly the sugars, and constipation, are the prominent internal causes.

Varieties.— Depending upon the degree of the exudative inflammation in the epithelium, there is produced an *erythematous, papular, vesicular,* or *pustular* eczema.

These forms either remain distinct or merge one into the other, somewhat masking the original type. The erythematous variety is characterized by redness and swelling over certain areas, especially the face. The papular type is known by the formation of small red papules which tend to group and coalesce. In the vesicular phase the upper layers of the epidermis are raised by the exudative process, forming vesicles or blebs which tend to coalesce and exude a viscid serum. These, however, are evanescent and are rarely seen because they are rapidly dissolved off, leaving a wet surface. If the latter form becomes infected by pyogenic skin bacteria or overloaded with leukocytes the pustular form develops.

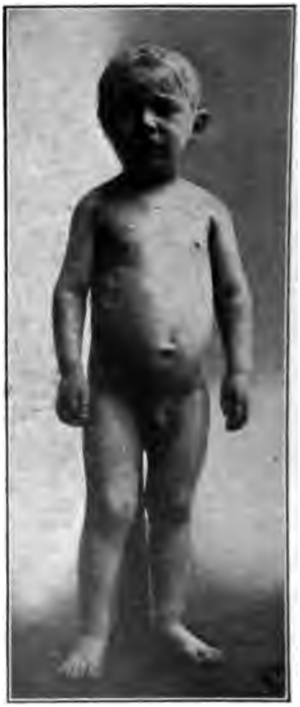

FIG. 172.— Chronic eczema.

SUB-VARIETIES.— When the discharge in the vesicular form dries readily it forms crusts (E. crustosum). If the exudation is profuse and the rete is uncovered, the weeping or moist form results (E. madinans vel rubrum). A squamous variety is superimposed or develops from the crusty, papular, or vesicular form when considerable epidermal infiltration and scaling appears.

CHRONIC VARIETIES.— These result from repeated recurrences, or exacerbations, or neglect of the etiological factors. The chief characteristic is the infiltration into the upper layer of the skin.

Symptomatology and Diagnosis.— All the varieties described above have certain common features, namely, redness, itching, and burning, accompanied by the formation of papules, vesicles, or pustules, the skin being either dry, moist, infiltrated, or scaling. In infants the scalp, face, and napkin region are most frequently attacked. The diagnosis is, as a rule, not difficult if the above description and classification is kept in mind. Erysipelas is distinguished by the rapidly spreading margin and high fever. Scabies is often confounded with eczema or the two are combined. The distribution and the itching, which is worse at night, the history of the other children or members of the family similarly affected, or the burrows and their contents themselves, can be depended upon to establish the diagnosis. Psoriasis is rare in early life; it is never moist; it is commonly found upon the elbows and knees, and has silvery scales. Syphilides occasionally are difficult to distinguish. The infiltration is deeper and greater; they do not burn or itch and are usually accompanied by other manifestations. In difficult cases the Wassermann test may be employed. Impetigo contagiosa has discrete vesicles upon a slightly reddened skin, with abrupt margins. They are contagious and the child easily inoculates itself in different parts of the body.

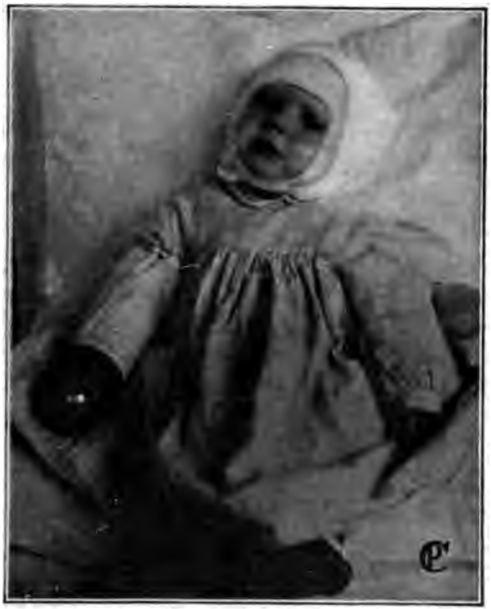

FIG. 173.— Child with eczema fitted with metallic glove to prevent scratching.

Prognosis.— This is variable, depending upon the underlying cause and the time of instituting treatment. Acute cases are favorable, but the chronic varieties are often intractable and persist with exacerbations and recurrences for years.

Acute Eczema.— Treatment. General.— The underlying cause should be carefully sought for and removed. If this is accomplished the cure will be well under way. Especially important is the proper regulation of the diet. If there is present such a condition as rickets, marasmus, or anemia the diet must be so arranged as to overcome the nutritional disorder. Cod-liver oil is often helpful. If, on the other hand, there has been overfeeding or indulgence in special articles, as the sugars or potatoes, such indiscretion must be stopped. The constipation should be relieved by correcting the diet or adding thereto such articles as fruits, the drinking of plenty of water and appropriate massage and exercise. In infants the milk of magnesia may be added to the milk for its laxative effect.

Local.— Never allow soap or water to be used on any eczematous surface. Cleansing can be satisfactorily accomplished with olive or linseed oil. The irritated skin must be treated by bland, soothing ointments or powders and scratching absolutely prevented. Rest for the inflamed area is imperative. Scratching is prevented by the use of masks, bandages, or sleeves, as shown in the illustration (Fig. 174).

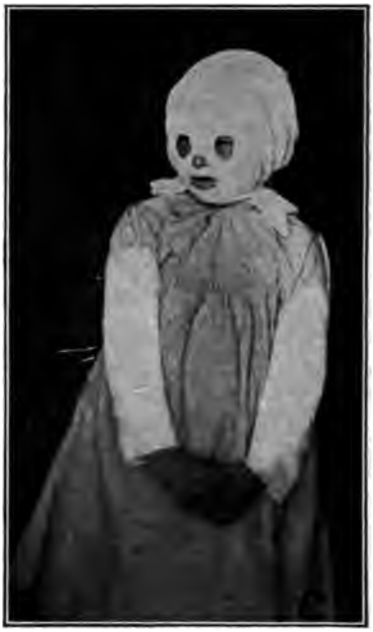

FIG. 174.— Eczema mask with stiff sleeves to prevent scratching

The mild cases of the erythematous, papular or moist types may be dusted with stearate of zinc, carbonate of magnesia, oxid of zinc, or boric acid.

In the inflammatory stages lotions of 2 per cent. boric acid, calamin, or a 1 per cent. solution of aluminum acetate, are applied as moist dressings. These soothe and reduce the inflammation. Occasionally small areas of weeping eczema may be rapidly improved by the primary application of ½ per cent. solution of the nitrate of silver. Among the ointments, Lassar's paste (N. F.) has given us the best results. It is applied thickly over the inflamed area and a retaining bandage or mask is applied. If thick crusts are present these must first be removed with applications of olive oil or boric acid ointment. The dressings are removed daily, the ointment carefully removed with absorbent cotton dipped in oil and the ointment reapplied.

Subacute Eczema.— If for any reason treatment has been delayed or has been unsuccessful in the acute stage more stimulating applications are necessary. The amount of oxid of zinc in the pasta Lassar (N. F.) may be increased, and small amounts of tar in the form of tincture picis liquidæ may be added, or the following may be used:

℞	Picis liquidæ	ʒss
	Sulphuris præcipitati	ʒj
	Unguenti zinci oxidi	℥ij

Misce et signa.— Apply morning and evening.

The same precautions must be observed to prevent scratching or irritation of the area, and the diet and bowels regulated.

Chronic Eczema.— Perseverance and careful watchfulness as to the action of the drugs used in this form will be necessary to effect a cure. The thick crusts must first be removed by applications of oil, boric or bismuth ointment. Stimulating ointments are then to be used. The majority of children bear the ointments well, but occasionally they are not well tolerated and stimulating lotions must be substituted. Tar is added in greater proportion to the ointments which have been recommended above. The tincture picis liquidæ or the liquor carbonis detergens act advantageously by producing stimulation and at the same time preventing itching. If large areas are affected, it is well to apply the tar ointment to limited portions of the skin first and observe its effect. After it has produced an acute reaction the milder pastes are applied.

Psoriasis.

Psoriasis among the skin affections is quite commonly observed in apparently healthy children. It begins as a papular affection with silvery scales on their summits. Their growth causes the commonly observed irregular patches with well-defined edges, of a bluish-red color, somewhat raised above the surrounding skin. Invariably silvery scales are found in these plaques, which can be readily removed, leaving a reddish glazed base. The extensor surfaces of the extremities are the favorite seats, next the trunk and scalp. The affection is a chronic one, with a great tendency to return in spite of well-directed treatment. Spontaneous cure in the summer months is not uncommon.

Treatment.— Bulkley emphasizes the dietetic treatment, and as the youthful patient is apt to be indiscreet, this should be the first consideration. A vegetarian diet may be appropriate for the child with a rheumatic history, although obviously unfitted for an anemic child below weight. Outdoor life at the seashore, with sea-bathing, is productive of much good. As soon as the lesion appears an application of green soap and a full bath are ordered to remove the superficial scales. A crysarobin ointment is applied to a small area in the strength of 5 to 10 grains to the ounce (except to the face) twice a day until the skin is clean. Latterly *X*-ray treatment has produced rapid results. Warning should always be given as to its liability to return and the importance of renewing the treatment early..

Miliaria.

(*Prickly Heat; Strophulus.*)

Miliaria is an affection developing at the sudariporous glands, usually during the summer months. It consists of numberless minute reddish papules and vesicles which appear with or after an unusual amount of perspiration. It is accompanied by itching and burning. After a few days to a week it subsides, although fresh outbreaks are likely if weather conditions are favorable. Evidences of scratching are often seen in children in connection with miliaria.

Treatment.— A 4 per cent. solution of boric acid is soothing, or with infants bran baths may be used. Frequent bathing and light clothing are prophylactic measures with children in the summer months. Removal to the seashore and sea-bathing produce rapid amelioration and cure.

Urticaria.

(*Nettle-rash; Hives.*)

Urticaria consists of large wheals made up of a localized area of edema in the papillary layer of the skin. Their centers are pale, while the margins are reddened. These wheals are distinctly felt by the hand and cause intense itching, especially at night. In the majority of cases urticaria results reflexly from intestinal causes. External irritants, such as the stinging nettle (hence one of its names), insect bites, etc., may bring on a typical attack. Certain fruits, as strawberries, produce urticaria in the predisposed. A small papular urticaria, consisting of minute papules, the tops of which are soon scratched off, causing a drop of serum or blood to exude, may often be seen in early life. This form may persist for months and, if neglected, will eventually result in a form of papular eczema. This variety is in all cases the result of a prolonged faulty diet. Strophulus is a name sometimes given to this condition.

Treatment.— Discover the offending cause, whether external or dietary. Locally, baths containing bicarbonate of soda, salines for the bowels, and local applications of ointments containing menthol, camphor, or carbolic acid. Small doses of salicylate of sodium or aspirin will relieve the intestinal fermentation that is often the underlying cause of urticaria.

Furunculosis.

This is a condition in which boils occur over any part of the body, but especially about the head. They are due to an infection of the skin with pyogenic organisms. The staphylococcus pyogenes aureus is the predominating direct cause. They differ in their virulency and occasionally cause marked systemic infection. Lowered vitality from malnutrition, improper feeding, previous debilitating diseases, and skin diseases predispose to the formation of furuncles.

They are usually small in size, multiple, and tend to rapid formation of pus. If uncared for, they rupture and the pus may inoculate other abraded surfaces. The areas are painful to the touch, reddish or bluish-red, and discharge a yellowish, creamy pus. Children with furuncles are restless, sleep badly, may have a low-grade temperature, cry inordinately, and lose flesh and strength.

Treatment. Local.— A general bath in bichlorid of mercury (1/5000) is first ordered; the furuncles in which suppuration has occurred are then surrounded with lanolin, incised and drained completely, exercising care not to infect neighboring regions with the pus. Remove local causes, if any, as scabies.

General.— Improve by diet and fresh air the general tone, prescribing strychnia, nux vomica, or the bitter wine of iron in the anemic. The resistance may be raised by the injection of vaccines in cases in which recurrences are common or in which the systemic infection is marked.

Herpes Zoster.

(*The Shingles; Zoster.*)

Herpes zoster is a painful acute inflammatory affection characterized by the production of a vesicular eruption appearing over the course of distribution of the cutaneous nerves. It is accompanied by an inflammation of the peripheral nerves or of the sensory ganglia of the posterior nerve roots.

Following a day or two of localized pain, there will appear on one side of the body a crop of vesicles having a reddened inflamed base, which are seen to follow the distribution of an affected nerve. The vesicles, as a rule, dry up without pustulation, unless infected by unclean children. Adults suffer more intensely with this affection than do children. It is recognized by its unilateral distribution over a nerve tract emphasized by the symptom of pain.

Treatment.— Locally, stearate of zinc as a dusting powder and a protective dressing are required. Small doses of phenacetin or codein may be required for the relief of pain. The incandescent lamp has given relief in some cases, as have the X-rays.

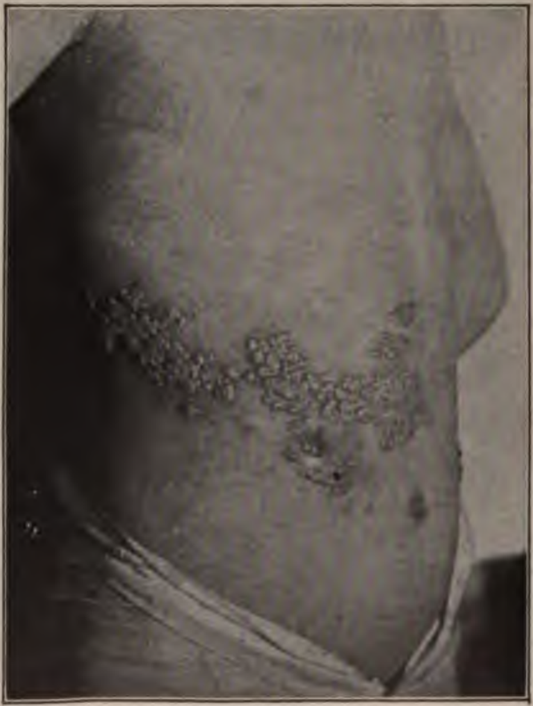

FIG. 175.— Herpes Zoster. (*Walker.*)

Pellagra.

Since the investigations by the Pellagra Commission cases of this disease have been found among the children, especially in our Southern States. The disease manifests itself in disorders of the digestive system, localized erythemata of the skin, and varied nervous symptoms. Its etiology is still obscure. It occurs chiefly among those living in unhygienic quarters, and who are likely to subsist upon damaged corn.

Symptoms.— The acute manifestations appear as undefined attacks of gastro-enteritis, accompanied by extreme lassitude and weakness. After a variable time skin lesions appear, for the most part upon the extensor surfaces of the arm and hand, and on the back of the face, neck and feet. The skin is mottled red, with a formation of blebs, which tend to become indurated and desiccated. These lesions are symmetrical. Except for restlessness and insomnia, further neurotic symptoms are not apt to manifest themselves in children.

Treatment.— Removal to a northern climate, improvement of hygienic conditions, plain nourishing food, with arsenic and iron, are indicated.

CHAPTER XLIII.

PARASITIC SKIN DISEASES.

Children are more liable to this group of diseases because of their vulnerable, tender skin, and because even clean children are apt to mingle with their uncared-for schoolmates.

Pediculosis.

These are insects readily seen under a low-power glass. The head louse is from 1 to 2 mm. in length, has a head, thorax and abdomen, and a sharp proboscis by which it attaches itself. They are extremely prolific, the female laying about fifty eggs, and the young being ready to multiply their kind after three weeks of life. The ova are enveloped in a capsule and are attached to the hair. These are commonly known as nits. The parasite feeds by imbedding its proboscis in the scalp and sucking. Thus the intense itching is caused. Scratching causes further irritation and patches of eczema may appear. The post-cervical glands are enlarged in neglected cases, and a red line at the base of the hair behind is often visible to confirm the diagnosis. The nits are distinguishable from dandruff scales by their position on the hair, their tenacity to it, and the ability to move them up and down the hair.

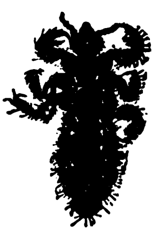

Fig. 176.—Pediculus capitis. Microphotograph. (*After Shoemaker.*)

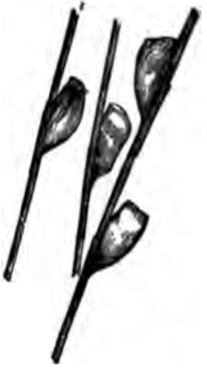

Fig. 177.—Nits of pediculus capitis. (*After Anderson.*)

Treatment.— Cut the hair as closely as possible in long-standing cases if no great objection is made. Apply a cap made of a light towel soaked in coal-oil (kerosene) or pour alcohol over the scalp, beginning at the base with the head held over a basin; the parasites will then move on before it and are washed away. In the daytime a 10 per cent. boric ointment is rubbed into the scalp in aggravated cases to allay the irritation. The nits are removed only after patient treatment with a fine comb.

Scabies.

(*The Itch.*)

Scabies is a disease of the skin produced by the Sarcoptes scabiei or itch-mite, which by its entrance into the skin produces burrows and an eruption of vesicles, pustules, and nodules. To these are added the scratch-marks produced by the patient's finger-nails. Infants and young children are greatly annoyed by the irritation and the evidences of scratching are observed early. The interdigital spaces, the wrists and flexor surfaces of the forearms, the toes and inner surfaces of the thighs are especially affected. The whole body may be invaded in unrecognized or neglected cases. The prominent symptom, itching, is worse when the patient is in a warm bed. If the child is predisposed to eczema this is almost sure to supervene, and, in fact, sometimes masks the original cause. The disease is commonly seen in dispensary children, who are apt to sleep with others and receive meager bodily attention.

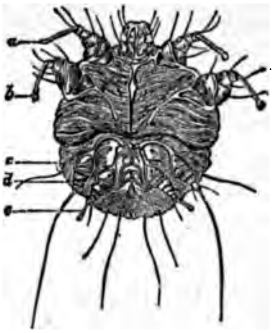

FIG. 178.— The Itch-mite. (*Neumann.*)

The itch-mite can with care be seen by the naked eye. The female is larger than the male. They are ovoid in shape, covered with hairs and have a pair of mandibles by which they attach themselves to the skin in burrowing. The female deposits its eggs and perishes, while the colony work their way to the outer skin and start burrows of their own.

Treatment.— The disease is readily amenable to cure if certain rules are followed faithfully. Remove all the clothing and bedclothes and sterilize them by boiling or baking in an oven. Follow a vigorous soap and hot-water bath with the application of sulphur ointment drachm one to the ounce. If eczema is present, use mild detergents, especially in the case of infants. Powdered sulphur may be used in children or a solution of styrax in the strength of half an ounce to the ounce of lanolin. The ointment selected should be applied to the whole body twice a day and two weekly baths taken. If there is a superadded eczema, treat the latter along the lines outlined for that disease.

Tinea Tonsurans.

(*Ringworm of the Scalp.*)

This is a contagious disease produced by a vegetable parasite, beginning as a mass of minute vesicles which soon affect the hair.

The lesion consists of a rounded patch showing broken-off hairs (shaven beard appearance) or a partly bald area, with extension taking place into the periphery. The central area is more or less reddened with a dirty scaly margin.

The disease is almost entirely confined to children, rarely appearing after puberty; children infect each other directly or through articles of clothing or toys or through their pets. The patches are rarely seen by the physician while vesicles are present.

The diagnosis must be made on the presence of the gnawed-off looking hairs in a rounded, reddened, scaly field in which the fungus can be found on the hairs.

Examination for the Fungus.— A loosened diseased hair may be placed on a slide and soaked in a 10 to 20 per cent. potash solution, and examined for the parasite under the microscope with at least a $\frac{1}{6}$-inch lens.

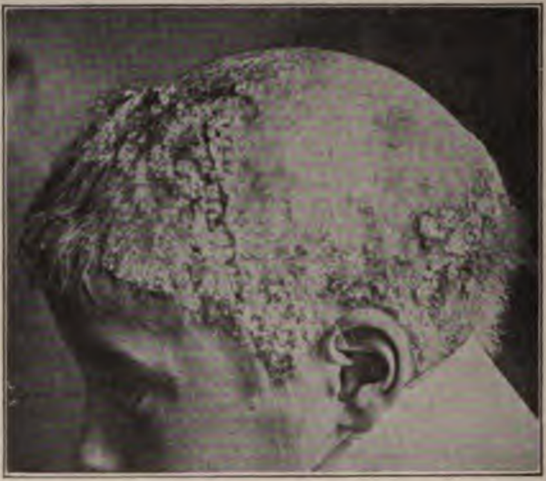

FIG. 179.— Favus of the scalp. (*Walker.*)

Treatment.— Ringworm does not respond quickly to treatment. If depilation is first performed, a better response to antiparasitic remedies is obtained. The scalp should be cleansed for several days with green soap and water. The surrounding hair is best kept short or, if possible, shaven about the lesion. A solution of potash applied on a piece of gauze and rubbed in will remove any débris that remains after the washings. An antiparasitic ointment is now daily applied and a protective dressing or cap used. We have tried to our satisfaction applications of oil of cade and castor oil, equal parts, or betanaphthol one-half to one drachm to the ounce. Ten per cent. aristol in flexible collodion has commended itself in children who are in asylums and apt to infect others. The *X*-rays are highly spoken of by dermatologists as a rapid and permanent means of cure.

Tinea Favosa.

Favus is a feebly contagious parasitic disease, caused by the Achorion Schonleinii. The lesion consists of sulphur-yellow areas on the scalp through which the hairs appear. The hair shaft is broken off, being diseased by the fungus. Closely examined, it is found that each hair is surrounded by a cup-shaped area; these coalescing produce a thick matted cake, dirty yellow in color, sometimes having a peculiar characteristic odor. Some pruritus is nearly always complained of. When the crusts are removed a scarred area with no hairs present is found. The diagnosis may be confirmed by an examination for the fungus under the microscope. A low power will answer (250 diameters). A fragment of hair passed through a potash solution will show the thick broad threads. The spores seen are of many shapes and sizes.

Treatment.— The treatment takes much time and patience. and at best, bald areas will occur at times. Depilation offers the safest and best chance of cure. This is performed after cutting short all the hair of the head, removing thoroughly all the crusts and débris with 10 per cent. boric acid ointment. The hairs are removed best with Bulkley's adhesive, made up with burgundy pitch or by repeated collodin applications. The hairs are thus removed *en masse*. Ten per cent. oleate of mercury is then applied night and morning with frequent soap and hot-water washings. When new hairs appear the microscope should again be used to guard against the reappearance of the parasite. The X-ray may here also give good results in competent hands.

Alopecia Areata.

(*Baldness.*)

This is a disease of the hairy scalp producing areas of baldness. The affection is apt to come on quite suddenly without any subjective symptoms. The underlying skin is white, clean, and soft. When the hair returns, which it does in children, it is soft, downy, and colorless at first. Later it slowly shows some color and the hairs themselves become firmer and of coarser texture. Schamberg believes there are two varieties: the parasitic and the trophoneurotic, thus explaining the divergence of opinion as to the etiology.

After a variable time, sometimes months, the hair in children returns, although even in early life relapses are seen.

Treatment.— Locally — many remedies have been advanced as serviceable. Measures which will increase the blood-supply in the scalp are helpful. Vigorous massage, followed by applications of 90 per cent. alcohol, has been useful in our hands. Lately the high-frequency current and the actinic rays have been extolled in the cure by dermatologists.

Ivy Poisoning.

The poisonous action of Rhus toxicodendron and other varieties of rhus (as the poison sumach) is not infrequent among children who are susceptible. City children, because of their unfamiliarity with the plant, are more apt to expose themselves to its venomous activity. When barefooted they are particularly liable to come in contact with it, and they readily spread the poison to their face, neck and genitals. The erythematous eruption appears within a few hours, and is followed by numerous vesicles which soon rupture and wet the surface with their serous exudation. Signs of inflammation, pain, heat and swelling are still further aggravated by intense itching. About the face the edema may produce great disfigurement; after reaching its height the erythema subsides in a few days, especially if restitution to the normal is assisted by appropriate treatment. Children and their parents should be taught to recognize these plants and know their characteristics.

Treatment.— The child should be restrained from infecting other parts of the body and from scratching the acutely inflamed area. If the eruption is seen soon after its appearance the parts should be copiously bathed with an alkaline solution, such as a 5 per cent. solution of bicarbonate of soda. Then apply gauze wet with a 2 per cent. solution of permanganate of potash. The physician, if susceptible himself, should wear rubber gloves when doing the dressing. The dressing should be applied in such a way as to prevent the ruptured vesicles from coming in contact with the healthy skin. After the acute stage is passed, soothing ointments such as Lassar's paste produce good results.

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